

STUDIES IN ARTOCARPUS AND ALLIED GENERA, IV.
A REVISION OF ARTOCARPUS SUBGENUS PSEUDOJACA¹

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Subgenus *Pseudojaca* Trécul, Ann. Sci. Nat. Bot. III. 8: 117. 1847.

Artocarpus section *Pseudojaca* Renner, Bot. Jahrb. 39: 368. 1907.

Leaves alternate and distichous, simple, entire or nearly so; gland-hairs superficial or slightly immersed, heads 1(-6)-celled; spongy mesophyll compact, lacking resin-cells. *Stipules* small, nonamplexicaul, scars lateral or intrapetiolar. *Inflorescences* without sterile, solid, elongate perianths. *Male head*, perianths 2-4-lobed or -partite, intermediates between perianths and interfloral bracts frequently present. *Syncarp* globose or \pm lobed, fleshy, the surface smooth, or papillate from perianth apices or from the clavate heads of interfloral bracts (series *Clavati*; the heads enlarged in *A. styracifolius* to form flexuous processes).

LECTOTYPE SPECIES: *Artocarpus lakoocha* Roxb.

In discussing the classification of *Artocarpus* in the previous paper in this series (Jour. Arnold Arb. 40: 125-127. 1959) it was pointed out that a marked contrast, which is reflected in the differing taxonomic treatments adopted, exists between the two rather distinct subgenera in the range of variation exhibited by their species. Subgenus *Artocarpus*, which was revised in that paper, was divided into two sections and a number of series based on a variety of morphological characters (e.g., orientation of the embryo, structure of the pericarp and position of the style, thin-walled *vs.* hypertrophied fruiting perianths, well-developed *vs.* vestigial interfloral bracts, and, in the leaves, presence or absence of a hypodermis and the shape of its cells, and the details of the gland-hairs).

In subgenus *Pseudojaca*, a very different taxonomic pattern is found, due partly to a more reduced inflorescence structure, but also to the more restricted variation in vegetative characters and the occurrence of parallel evolution. Quantitative rather than qualitative characters have had to be used with much greater frequency than in subg. *Artocarpus*, both in distinguishing and in arranging the species. Nineteen of the twenty species

¹ The preceding papers in this series will be found in Jour. Arnold Arb. 40: 1-29; 30-37; 113-155, 298-368. 1959.

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recognized here are assigned to section *Pseudojaca*, in which the species have been divided into two series on the basis of the shape of the interfloral bracts. They have been arranged within the larger of these according to the length of the peduncles relative to the inflorescence heads and the shape of the male head, in conjunction with various other characters. There is a single anomalous species, *Artocarpus altissimus*, which appears to be referable to subg. *Pseudojaca*, but which is distinguished by the trinerved base and glandular-crenate margin of the leaves and by the deeply bifid styles. This is placed in a separate section, *Glandulifolium*, at the end of the paper and is further discussed there.

Before proceeding to a discussion of section *Pseudojaca*, some general comments will be made on characters that have been of use in distinguishing the species in this subgenus. In contrast to subg. *Artocarpus*, the internal structure of the syncarp has been found to provide characters of taxonomic significance only at the specific level. The fusion of the proximal regions of the perianths, the clear differentiation of an endocarp (as opposed to the induration of the entire pericarp wall), and the development of fleshy fruiting perianths (slight as compared with subg. *Artocarpus*) may distinguish apparently allied species. However, with one exception, only the first of these characters is taken into account in this discussion since evidence is still inadequate concerning the others. It is probable that a larger number of species have somewhat fleshy fruiting perianths than is recorded here, since these can only be recognized in very well preserved syncarps. External characters of the female inflorescence are of considerable value in providing specific distinctions (as in subg. *Artocarpus*). These include whether the surface is smooth or papillate at anthesis and maturity, the degree of exertion of the styles, and whether or not the syncarp is lobed.

The leaves also differ markedly from those of subg. *Artocarpus* in being rather uniform in their internal structure and in the details of the gland-hairs. However, the characters of the indumentum are of considerable taxonomic value, though once more primarily at the specific level. The hairs on the leaves and twigs may be straight, undulate or crisped, with either smooth or rough walls. In some species a varying proportion are rather stout, smooth-walled and hooked at the tip, and the presence of such hairs can be of assistance in identifying sterile material. In general, the hairs on the leaves are restricted almost entirely to the venation, and the prominence of the latter on the lower surface of the leaf is correlated with the density of the indumentum. However, in two of the species with prominent, pubescent venation, and in three others having the venation not or slightly prominent beneath and subglabrous, nearly all the cells on the areolae on the lower surface may bear crisped hairs. The minute tomentum which is thus produced causes the leaves to appear glaucous beneath and seems to have been developed independently at least twice within the subgenus. There are six taxa in which the leaves are consistently glabrous or nearly so, and in five of these (*A. gomezianus* ssp. *gomezianus*, *A. rubrovenius*, *A. nitidus*, *A. vrieseanus* var. *subsessilis* and *A. xantho-*

carpus) a prominent reticulum is also lacking. With the exception of the last two, however, the similarity of the leaves in this respect is not, apparently, an indication of close taxonomic affinity. In *A. reticulatus* the subglabrous venation is acutely prominent beneath.

The male inflorescences have been found to be of value in indicating wider affinities with the subgenus, but, unlike the female inflorescences, they quite often fail to provide satisfactory distinctions between the species. There is usually a characteristic shape for each species, but the variation in size may be considerable, so that the dimensions in allied species overlap. Specimens bearing male inflorescences, especially if immature, must often, therefore, be identified primarily by the use of vegetative characters, whereas specimens bearing female heads at any stage from anthesis to maturity usually can be identified chiefly on their characteristics.

The species have been delimited primarily on the basis of inflorescence characters, and, in nearly all, one or more collections have been seen bearing both male and female inflorescences, enabling the characters to be correlated with certainty. However, since so many of the collections bear inflorescences of one sex only, or are sterile, vegetative characters have been of considerable practical importance in assigning material to the species recognized. (It may be remarked that the matching of collections on vegetative characters was equally necessary in subg. *Artocarpus*, although the more clear-cut specific distinctions made the proceeding less critical.)

In spite of the rather minor differences between some of the taxa in the characters of the leaves and twigs, it is possible to identify nearly all of the collections with male inflorescences and the majority of sterile collections. While this is partly a question of becoming familiar with the group, there are usually definable distinctions, and these are pointed out in notes to the species. For the purpose of identifying specimens on vegetative characters, subg. *Pseudojaca* may be divided artificially into three groups of species characteristically having "pubescent," "glabrous" and "glaucous" leaves respectively. (Two species have subspecific taxa in both "pubescent" and "glabrous" groups, and in at least two of the "pubescent" species the leaves may also be glaucous beneath). The majority of the specimens can be assigned readily to one of these groups, and the notes give the distinguishing characters for all the species in the appropriate group that have overlapping ranges.²

The two series recognized in section *Pseudojaca* are distinguished on the basis of a difference in the shape of the heads of the stalked interfloral bracts. Most of the species have bracts with peltate, discoid, ciliate heads, and are placed in series *Peltati*. There are, however, three species occurring in northern Indochina and southern China, in which the bracts have clavate or spatulate heads. These are assigned to series *Clavati*, which is further

² Notes on "pubescent" species will be found for India under *Artocarpus gomezi-anus* ssp. *zeylanicus* (31), for southeast Asia under *A. tonkinensis* (30), for western Malaysia under *A. dadah* (32), *A. fulvicortex* (40) and *A. tomentosulus* (41), and for the Philippines and eastern Malaysia under *A. vrieseanus* (33) and *A. fretessii* (35); notes on "glabrous" species are given under *A. nitidus* (43) and on "glaucous" species under *A. hypargyreus* (45).

distinguished by a small but significant difference in the length of the anthers, these measuring 0.3–0.5 mm., as compared with 0.15–0.2 mm. in series *Peltati*. The dense pubescence on the bracts gives the surface of the male head a characteristic appearance; in series *Peltati* the surface is not conspicuously pubescent and the discoid heads of the bracts can be distinguished under the binocular microscope. In two of the species in series *Clavati*, *Artocarpus hypargyreus* and *A. petelotii*, the heads of the bracts form papillae on the surface of the syncarp (not to be confused with the papillate apices of the perianths found in some members of series *Peltati*), but in the third, *A. styracifolius*, they are enlarged to form numerous flexuous, cylindric processes. The proximal region of the perianths is free in *A. hypargyreus*, partially fused in *A. petelotii* and completely fused in *A. styracifolius*. However, in spite of the very distinctive syncarp, this last species shows a relationship to *A. hypargyreus* in having leaves that are tomentulose on the areolae and hence glaucous beneath, with subglabrous main veins. In *A. petelotii*, on the other hand, the leaves are similar to those of most pubescent-leaved members of series *Peltati* in having the venation pubescent beneath, but the areolae glabrous.

In series *Peltati*, as already indicated, it has been found that the most "natural" arrangement of the species apparently can be achieved by subdividing them according to the relative length of the head and the peduncle in the inflorescences at anthesis. The sixteen species then fall into two groups, in the first of which the peduncle is nearly always as long as, or longer than the head, and in the second of which it is less than half the length of the head, at least in the male inflorescence. The length of the peduncle in the female inflorescence seems to be inherently more variable than in the male inflorescence. Its relationship to the size of the head does not, in any case, hold beyond anthesis, owing to the enlargement of the latter as the syncarp matures, although the absolute length of the peduncle is usually greater in the first group. In this group, four pairs of species can be recognized (defined by a combination of characters), but their interrelationships are not clear, and there are also two species showing reticulate alliances. The order adopted for the species is, in consequence, partly one of convenience. In the second group, the six species can again be assigned to three pairs showing a more or less close affinity to each other. An informal review of series *Peltati*, which is intended to indicate the type of variation that is found, and the reasons for the arrangement adopted, follows.

In the first group of species, *Artocarpus longifolius* (Borneo) and *A. ovatus* (Philippine Islands) are distinguished by the long-pedunculate, rather small syncarps, the usually narrowly obovoid male head and the relatively narrow, pubescent leaves with short petioles. The syncarp has the perianths completely fused in *A. longifolius*, but free proximally in *A. ovatus*, and in the latter there are abundant persistent bracts on the surface. Except for *A. tonkinensis* the remaining species have globose or pulvinate to short-obovoid male heads often overlapping in size and shape in the different species.

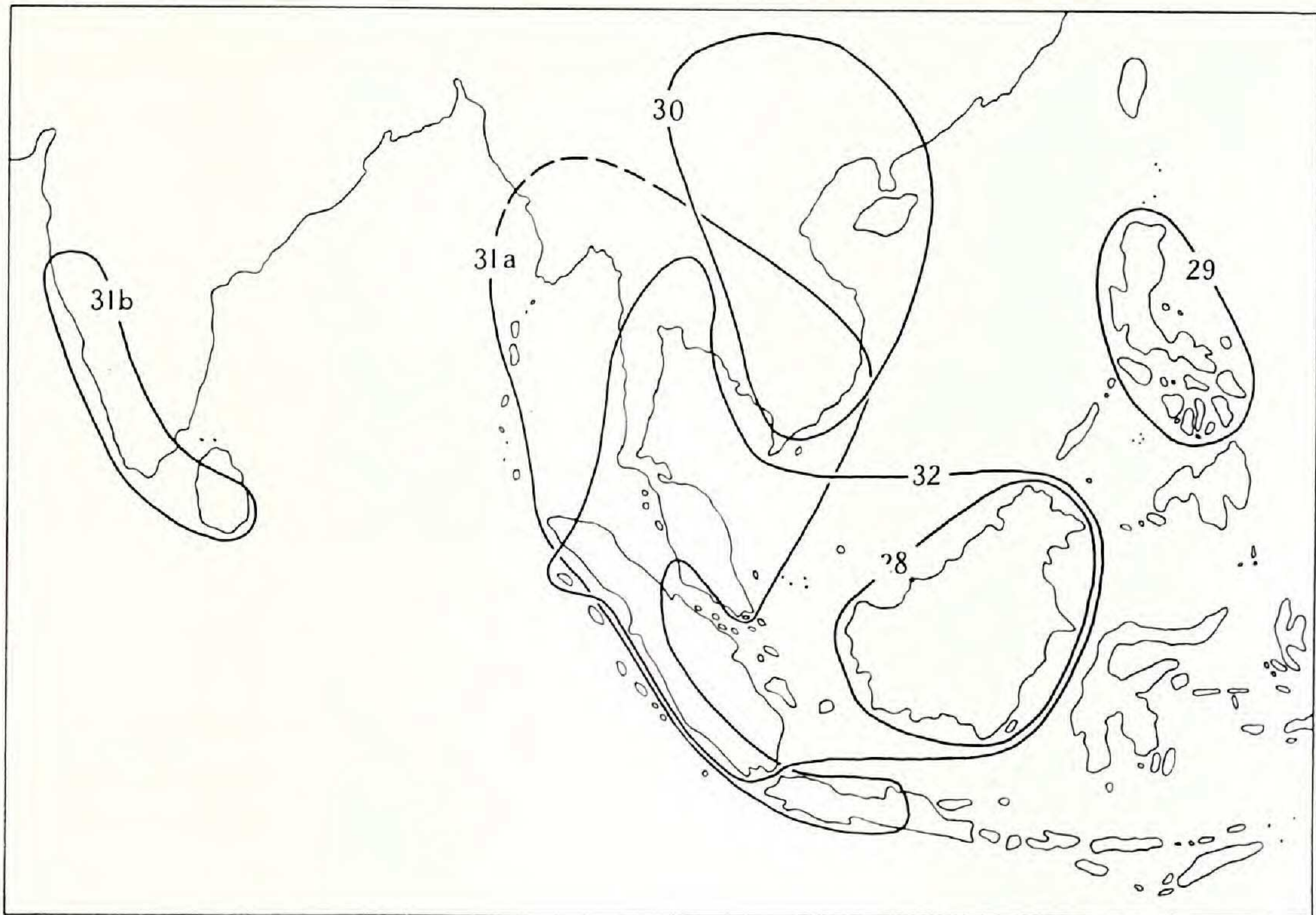


FIG. 17. Distribution of some species of subg. PSEUDOJACA. 28, *Artocarpus longifolius*; 29, *A. ovatus*; 30, *A. tonkinensis*; 31, *A. gomezianus*, a, ssp. *gomezianus* (omitting records from Assam and Cagayan Sulu), b, ssp. *zeylanicus*; 32, *A. dadah*.

The next pair of species consists of *A. gomezianus* (ssp. *gomezianus* from Burma and Indochina to western Malaysia, and ssp. *zeylanicus* in southern India and Ceylon) and *A. dadah* (Siam, Tenasserim and western Malaysia), both of which have smooth, globose syncarps with few or no interfloral bracts and free, fleshy fruiting perianths. The former is a species of monsoon regions and the latter chiefly of everwet forests, so that they are distributed differently in western Malaysia. *Artocarpus dadah* is also distinguished from ssp. *gomezianus* by having pubescent, not glabrous leaves, and from ssp. *zeylanicus* by the colour of the hairs, which are red-brown, not greyish.

Artocarpus vrieseanus (Mindanao to New Guinea and Melanesia) and *A. xanthocarpus* (northern and central Philippines) have syncarps that are very similar externally to those of the two preceding species, but are distinguished from these and the syncarps of the following species-pair by the complete fusion of the perianths. *Artocarpus vrieseanus* is a very variable species in which the proportions of the head and peduncle characteristic of this group do not always hold; of the four varieties recognized, three have more or less pubescent leaves, but one has glabrous leaves and consistently short-pedunculate inflorescences. Superficially, this species often bears a strong resemblance to *A. dadah* or to *A. fretessii*, which is placed after *A. xanthocarpus*, although it is distinguished from the former by the frequently crisped indumentum on the twigs. This similarity has deter-

mined the arrangement adopted for these species, and the syncarp character, although a convenient distinction, may not have any great taxonomic significance. *Artocarpus xanthocarpus* is superficially similar to *A. nitidus*, a species belonging to the second group, in its small, glabrous leaves and short-pedunculate male inflorescences. However, the male head is often little or no longer than the peduncle and this, with the fused perianths in the syncarp, suggests that *A. xanthocarpus* is best placed here.

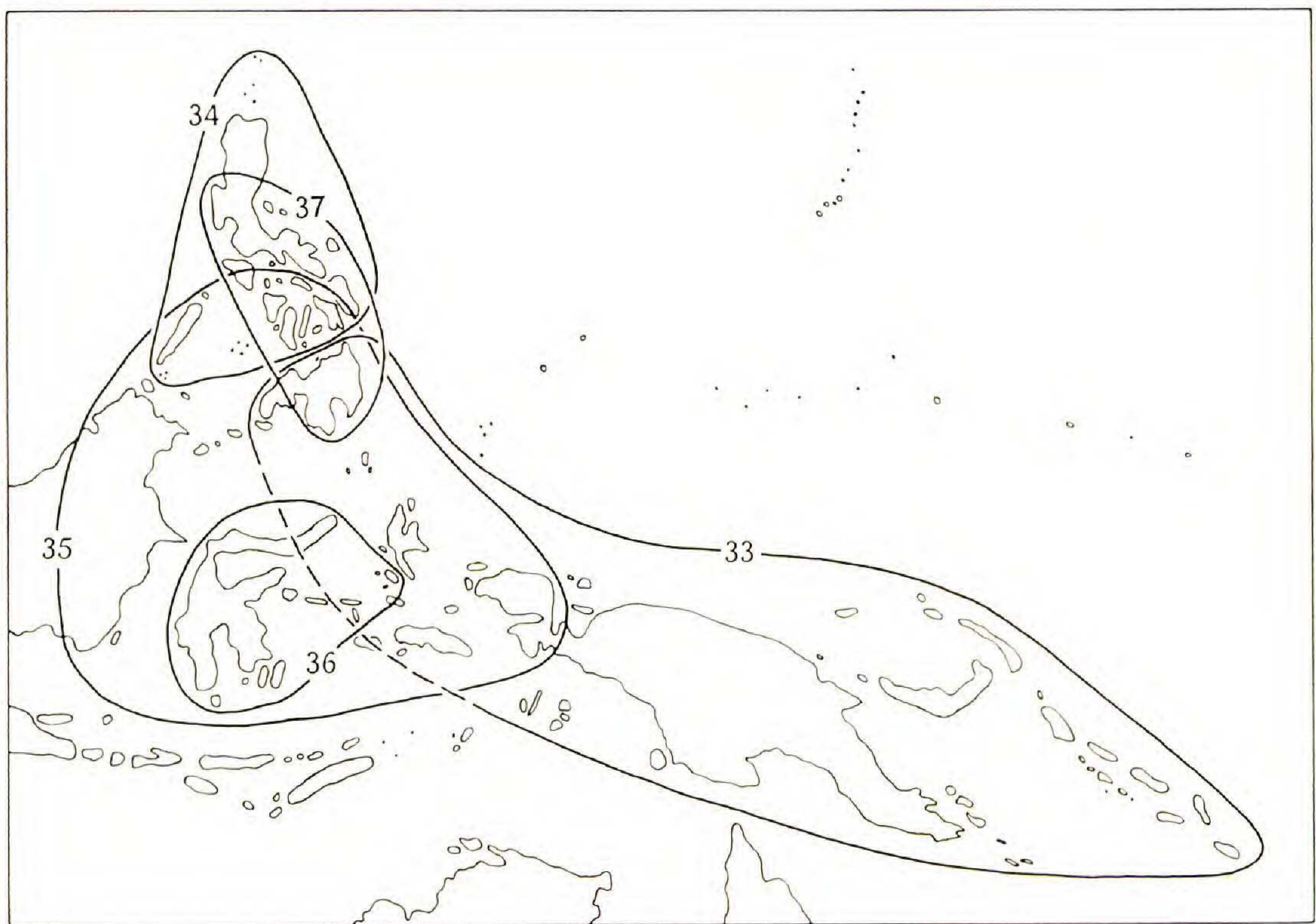


FIG. 18. Distribution of some species of subg. PSEUDOJACA. 33, *Artocarpus vrieseanus*; 34, *A. xanthocarpus*; 35, *A. fretessii*; 36, *A. reticulatus*; 37, *A. subrotundifolius*.

Artocarpus fretessii (Borneo and the Philippines to western New Guinea) and *A. reticulatus* (Celebes and Moluccas) have female inflorescences that are distinguished by being distinctly papillate at anthesis and usually strongly lobed at maturity with rather few bracts. The former has a distribution overlapping that of *A. vrieseanus* and is often difficult to distinguish when sterile, the hairs likewise being crisped on the twigs. *Artocarpus reticulatus* differs from *A. fretessii* in being larger in all its parts and in having nearly glabrous leaves which, as noted above, have an acutely prominent reticulum, unlike those of the other glabrous-leaved species.

There remain two species assigned to this group which show reticulate interrelationships. *Artocarpus tonkinensis* (Indochina and southern China) is placed after *A. longifolius* and *A. ovatus*, since it resembles both in having a relatively narrow, obovoid or ellipsoid male head and the latter in having numerous persistent bracts on the syncarp. It differs from these species, however, in having crisped hairs, as in *A. vrieseanus* and *A. fretessii*. The

perianths are fused in the syncarp, and the leaves have fewer lateral veins than in any other species of this group. *Artocarpus subrotundifolius* (Philippine Islands), which is placed last in this group, does not show any very clear alliances with the other members. The length of the peduncles, although exceedingly variable, as is the size of the very large male head, suggests that the species should be placed in this group; it also resembles *A. fretessii* and *A. reticulatus* in having a distinctly papillate female head at anthesis, with the perianths free proximally, although the syncarp is only shallowly lobed and the indumentum of the twig is patent. However, in all these characters, and in the long-exserted styles (also found, however, in *A. reticulatus*) and the broad, long-petiolate, pubescent leaves, often with an oblique base, it also resembles *A. lakoocha*, placed first in the following group of species.

The species of the second group may be characterized by the consistently short male peduncle and show no obvious alliances with members of the first group, with the exception of *A. subrotundifolius*. There is a considerable range of variation and, unlike the members of the first group, the species are most readily defined on characters of the male inflorescences and the vegetative parts, although syncarp characters can also be used.

The first four species have rather large, broad leaves, with long petioles and an often oblique base, but fall into two quite distinct pairs. *Artocarpus lakoocha* (India to Indochina and Yunnan) and *A. rubrovenius* (Philippine Islands) both have rather large, obovoid to clavate (rarely ellipsoid) male heads, but differ considerably in their leaves, those of the former being pubescent on the prominent reticulum, and those of the latter being glabrous, without a prominent reticulum. The second pair of species, *A. fulvicortex* (Malaya and Sumatra) and *A. tomentosulus* (Borneo), both of which are newly described, are distinguished from the other pubescent-leaved members of subgenus *Pseudojaca* by having the areolae on the lower surface, between the markedly prominent, pubescent reticulum, frequently tomentulose, and by the twigs being merely puberulent when young. They also differ from the other species of this second group in having globose male heads, but, whereas the syncarps in *A. fulvicortex* are sessile, like the male heads, in *A. tomentosulus* the single syncarp seen has a peduncle 25 mm. long. In the former the syncarp has completely fused perianths; in the latter the structure is unknown, but in the remaining species of this group the perianths are free proximally.

Finally, *Artocarpus glaucus* (western Malaysia) and *A. nitidus* (Assam to southern China, western Malaysia and the Philippines), have obovoid, clavate or cylindrical male heads rather smaller than in the first pair of species, and leaves that are also smaller with shorter petioles. *Artocarpus glaucus* is distinguished by the very long, narrow male head, and, as the name suggests, by the leaves, which are tomentulose on the areolae beneath, while the main veins are subglabrous. Although this indumentum resembles that found in two species of series *Clavati*, there is no other indication of an alliance between these species and *A. glaucus*, nor is there any evidence of a close relationship with the preceding pair of species. The

last species in this group is *A. nitidus*, which has a smaller male head than *A. glaucus*. It is widely distributed, and five subspecies are recognized on the basis of differences in the size and indumentum of the syncarp, associated with slight, but characteristic, variations in the glabrous leaves.

The species of section *Pseudojaca* are thus separated by a variety of relatively minor characters, so that, although they are readily distinguishable (given adequate material), they require somewhat complex definition. There has also been some parallel evolution, especially, it would seem, in the loss of the indumentum, or the development of a tomentum, and in the complete fusion of the perianths in the syncarp. The distribution of some types of hairs among the species, especially between *A. fretessii* and *A. vrieseanus*, suggests the occurrence of some introgression. In view of all this it does not seem desirable to discuss in further detail interrelationships or evolutionary trends among the species, nor is it possible to define satisfactorily any supra-specific taxa beyond the two series here recognized.

The key which follows is based, as far as possible, on "natural" characters, but practical considerations have, where necessary, taken first place in its construction. It is hoped that it will make possible the identification of most collections with male or female inflorescences at any stage from anthesis to maturity. (Where a dichotomy has had to be based on the inflorescences of one sex only, the specimens bearing inflorescences of the other sex are eliminated, if possible, further on in the key under the first alternative.) For sterile specimens, or those with very young inflorescences, the use of the footnote given above as a guide to the notes on vegetative distinctions is suggested. It should perhaps be pointed out that, while the species may be classified as characteristically "pubescent," "glabrous" or "glaucous," there are sufficient inconsistencies in the first two of these groups to limit the value of this distinction in preparing the key. The numbering of the species follows on from the previous paper in this series.

KEY TO THE SPECIES OF ARTOCARPUS SUBGENUS PSEUDOJACA

1. Styles bifid; leaves glandular-crenate, base trinerved. 47. *A. altissimus*.
1. Styles simple; leaves not as above.
 2. Leaves densely greyish tomentulose beneath, except for the subglabrous main veins.
 3. Syncarp peduncle to 5 mm.; male peduncle to 3 mm.; leaves with 8–15 pairs lateral veins. 42. *A. glaucus*.
 3. Syncarp peduncle 10–50 mm.; male peduncle 5–25 mm.; leaves with 4–9 pairs lateral veins.
 4. Syncarp covered with flexuous processes; male head 4–7 mm. across; leaves with lamina decurrent on petiole, reticulum not prominent beneath. 46. *A. styracifolius*.
 4. Syncarp papillate; male head 10–15 mm. across; leaves cuneate at the base, not decurrent, reticulum prominent beneath. 45. *A. hypargyreus*.

2. Leaves not tomentulose beneath, *or* main veins and reticulum also patent-pubescent.
5. Peduncles in inflorescences at anthesis at least as long as the head, *or*, if shorter in the male inflorescence, at least 7 mm.; in mature syncarp at least 13 mm.³
6. Male peduncle to 3 mm., head to 7 mm. across; leaves glabrous, reticulum not prominent beneath.
 7. Styles exerted to 0.4 mm.; male head with bracts stoutly stalked; leaves rounded or auriculate at the base, not decurrent; (syncarp peduncle to 7 mm.). 33. *A. vrieseanus* var. *subsessilis*.
 7. Styles exerted to c. 1 mm.; male head with bracts slenderly stalked; leaves usually cuneate and slightly decurrent at the base; (syncarp peduncle to 11 mm.). 34. *A. xanthocarpus*.
6. Male peduncle at least 7 mm. *and/or* leaves with the reticulum prominent and usually pubescent beneath.
 8. Petiole 3-8 × 3.5-5 mm., base of leaf cuneate or auriculate; syncarp peduncle 30-60 mm.; male head obovoid, 8-20 × 5-12 mm., peduncle 12-30 mm. 28. *A. longifolius*.
 8. Petiole not so short and stout, *or* base of leaf cordate.
 9. Female head at anthesis with styles exerted to at least 1 mm. (a few usually persisting on syncarp).
 10. Styles exerted to 1-2.5 mm.; syncarp peduncle 40(?) - 75 mm.; male head 25-50 × 20-35 mm.; petiole (15-)25-65 mm. 37. *A. subrotundifolius*.
 10. Styles exerted to 1-1.5 mm.; syncarp peduncle to 45 mm.; male head smaller.
 11. Leaves glabrous or scabrid-puberulent on the prominent reticulum from hooked hairs, petiole 13-25 mm.; female head verrucose from conical papillae, or lobed at maturity and smooth over the lobes, peduncle 25-45 mm.; male head c. 15 mm. across. 36. *A. reticulatus*.
 11. Leaves pubescent, without hooked hairs; female head papillate to nearly smooth.
 12. Syncarp peduncle 35-40 mm.; leaves with 7-11 pairs lateral veins; petiole to 18 mm.; surface of the male head densely pubescent from the spatulate (not peltate and discoid) heads of the bracts. 44. *A. petelotii*.
 12. Syncarp peduncle 8-25 mm.; leaves with 9-18 pairs lateral veins, petiole 15-45 mm.; (male head 12-23 × 10-18 mm., surface covered by peltate, discoid, ciliate heads of bracts, peduncle 2-5 mm.). 38. *A. lakoocha*.
 9. Female head at anthesis with styles exerted to 0.7 mm. (a few usually persisting on syncarp).
 13. Syncarp subglobose or shallowly lobed, numerous dis-

³ There are a few species in which the length of the peduncle in relation to that of the head is variable, or in which the proportions differ in the male and female inflorescences; these are brought down on both sides of this dichotomy, the characters of the discordant inflorescences being given in parentheses.

- coid heads of bracts persisting on surface, often completely covering head at anthesis; male head obovoid to ellipsoid, at least 8 mm. across, peduncle at least 7 mm.
14. Leaves glabrous, reticulum not prominent beneath. 31. *A. gomezianus* ssp. *gomezianus*.
14. Leaves pubescent, reticulum distinctly prominent beneath.
15. Petiole 15–45 mm.; (male head to 7 mm. across, peduncle to 2 mm.). 41. *A. tomentosulus*.
15. Petiole to 15 mm.
16. Syncarp peduncle (40–)70–80 mm., perianths free proximally; male peduncle 20–40 mm.; twigs with patent hairs; leaves with 11–20 pairs lateral veins. 29. *A. ovatus*.
16. Syncarp peduncle 30–40(–65) mm., perianths completely fused; male peduncle 7–12 mm.; twigs with appressed and crisped hairs; leaves with 6–9 pairs lateral veins. 30. *A. tonkinensis*.
13. Syncarp subglobose or lobed, bracts lacking at least on lobes, often nearly all deciduous before anthesis; male head pulvinate, globose or obovoid, if obovoid less than 8 mm. across.
17. Young twigs greyish pubescent, *or*, if glabrous, leaves without prominent intercostal veins beneath. 31. *A. gomezianus*.
17. Young twigs red-brown to yellow pubescent, *or*, if glabrous, leaves with prominent intercostal veins beneath.
18. Syncarp with well-defined, subglobose lobes (unless many seeds are formed), the surface between papillate and often with bracts persisting, perianths free proximally; male heads to 7 mm. across, often borne on short-shoots on older wood, bracts slenderly stalked; twigs usually with subappressed and crisped hairs. 35. *A. fretessii*.
18. Syncarp globose or shallowly lobed, bracts usually nearly all deciduous; male heads to 15 mm. across, usually in leaf-axils, bracts stoutly stalked.
19. Syncarp yellow, subglobose and smooth, or (in var. *papillosus*) papillate at anthesis and often shallowly lobed at maturity, perianths completely fused; twigs usually with some or all of the hairs subappressed and crisped, varying subglabrous; larger leaves with up to 13 pairs lateral veins. 33. *A. vrieseanus*.

19. Syncarp green with pink flesh, subglobose and smooth, perianths free proximally; twigs with patent hairs; larger leaves with up to 20 pairs lateral veins. 32. *A. dadah*.
5. Peduncles in inflorescences at anthesis less than half the length of the heads, in male inflorescence to 5 mm., in mature syncarp to 12 mm.
20. Leaves glabrous, reticulum not or scarcely prominent beneath.
21. Male head 15–45 × 10–25 mm.; leaves often broadly elliptic to ovate, with a broad, oblique base, petiole 15–30 mm. 39. *A. rubrovenius*.
21. Male head to 12 × 7 mm.; petiole 5–25 mm.
22. Female head with perianths free proximally, styles exerted to 0.5 mm.; male head obovoid, cylindrical or clavate. 43. *A. nitidus*.
22. Female head with perianths completely fused; male head short-obovoid to globose.
23. Styles exerted to 0.4 mm.; male head with bracts stoutly stalked; leaves rounded or auriculate at the base, not decurrent.
- 33. *A. vrieseanus* var. *subsessilis*.
23. Styles exerted to c. 1 mm.; male head with bracts slenderly stalked; leaves usually cuneate and slightly decurrent at the base.
- 34. *A. xanthocarpus*.
20. Leaves pubescent, reticulum distinctly prominent beneath.
24. Petiole to 15 mm. 33. *A. vrieseanus*.
24. Petiole 15–45 mm.
25. Male head 12–25 × 10–18 mm.; styles exerted to 1–1.5 mm.; twigs pubescent; leaves never with the intervenium tomentulose beneath. 38. *A. lakoocha*.
25. Male head to 7 × 6 mm.; styles exerted to 0.5 mm.; twigs subglabrous; leaves often with the intervenium tomentulose beneath.
26. Leaves with 6–10 pairs lateral veins and few intercostals; syncarp peduncle to 5 mm.
- 40. *A. fulvicortex*.
26. Leaves with 10–14 pairs lateral veins and numerous intercostals; (syncarp peduncle c. 25 mm.).
- 41. *A. tomentosulus*.

Section *Pseudojaca*

Folia margine non glandulifera. *Capitula feminea* stylis simplicibus.

Series *Peltati* Jarrett, ser. nov.

Inflorescentiae bracteis interfloralibus peltatis. *Capitula mascula* cellis antherum 0.15–0.2 mm. longis.

28. *Artocarpus longifolius* Becc. For. Borneo, 629. 1902, "*longifolia*." Holotype, Borneo, *Teysmann HB 11312* (FI).

Trees, height to 21 m. Twigs 4–6 mm. thick, subglabrous to densely

pubescent, hairs red-brown to yellowish, patent, straight or some longer and hooked at the tip. *Leaves* 9–33 × 4.5–11 cm., obovate-elliptic or elliptic, with an acumen to 2 cm. long, base cuneate, often auriculate, margin entire; main veins and reticulum very prominent beneath; glabrous above except for the pubescent main veins, venation beneath pubescent, hairs colourless, straight, varying to subglabrous; lateral veins 9–14 pairs, curved; intercostals parallel; green, drying pale or reddish brown, lighter beneath, venation concolorous; petiole 3–8 mm. long, stout.

Inflorescences solitary in leaf-axils. *At anthesis: male head* 8–20 × 5–12 mm., obovoid; perianths of c. 3 free segments 0.4 mm. long; stamen 0.5 mm. long, filament broad, contracted above, anther-cells globose, 0.15 mm. long; bracts slenderly stalked, heads peltate, to 0.3 mm. across, these and perianths minutely pubescent; peduncle 12–30 × 1 mm., pubescent, hairs rufous or whitish; *female head* with styles exerted to 0.2 mm. through low papillae emerging between peltate bracts. *Syncarp* (submature) 2 cm. across, ellipsoid, drying fulvous, the surface nearly smooth, very shortly pubescent, with scattered persistent bracts; proximal region of perianths fused; peduncle 30–60 × 2–4 mm., pubescent, hairs rufous or whitish.

DISTRIBUTION: endemic to Borneo.

Borneo. SARAWAK. Kuching, *Haviland* 2189 (BM, K, SING, ♂, ♀), *Haviland & Hose* 3205 (BM, ♂ ♀), 3206 (K, ♂, ♀). WEST BORNEO. Landak, *Teysmann HB* 11312, 1875 (FI, ♂, ♀). SOUTH AND SOUTHEAST BORNEO. Puruktjahu, *bb* 11109 (BO). EAST AND NORTHEAST BORNEO. W. Kutei: near Lahum, *Endert* 1840 (L, ♂). E. Kutei: Samarinda, Blajan River, Loa Lampong, *Nedi* 769 (CGE, L, ♂, ♀).

The material of *Artocarpus longifolius* is limited and the variation in the indumentum is considerable, but the collections agree in the characters of the inflorescences and in the distinctive shape of the leaves and petioles. The large stipules (5–15 mm. long), which are frequently persistent, and the short, stout petioles are unique in subg. *Pseudojaca*. The subglabrous collections may be from saplings or sucker shoots, since the leaves and internodes are somewhat longer than in the pubescent collections. The cuneate base of the leaf and the shorter petiole, in addition to the smaller inflorescences and the completely fused perianths in the syncarp, distinguish this species from *Artocarpus ovatus*.

29. **Artocarpus ovatus** Blanco, Fl. Filip. 666. 1837, "*Arctocarpus ovata*," non Noronha, 1790 (nomen nudum), ed. 3. 3: 73. *plate*. 1879; Vidal, Revis. Pl. Vasc. Filip. 254. 1886; Ahern, Timber Tree Sp. Philip. 21. *plate*. 1901. Neotype, Luzon, *Merrill SB* 254 (BM).

Artocarpus cumingiana Tréc. Ann. Sci. Nat. Bot. III. 8: 119. *t.* 4, *figs.* 117, 118. 1847, "*Cummingiana*"; Fern.-Villar, Noviss. App. 203. 1880; Merr. Publ. Gov. Lab. Philip. 27: 80. 1905, Sp. Blancoanae, 125. 1918, Enum. Philip. Pl. 2: 40. 1923; Renner, Bot. Jahrb. 39: 370. 1907; Elmer, Leaf. Philip. Bot. 2: 620. 1909; Whitford, Bull. Bur. For. Philip. 10(2): 28. *t.* 6. 1911; Brown, *ibid.* 22(2): 70. *fig.* 23. 1921. Holotype, Cebu, *Cuming* 1784 (P); isotypes (BM, CGE, K).

Artocarpus acuminatissima Merr. Philip. Jour. Sci. 18: 49. 1921, Enum. Philip. Pl. 2: 40. 1923. Holotype, Luzon, *De Mesa & Rosario* FB 22777 (PNH, destroyed); isotypes (K, US); lectotype (K).

Trees, height to 25 m., bark brown. Twigs 2.5–4.5 thick, smooth or finely rugose, short-pubescent, hairs red-brown to pale yellow, patent, straight, or some longer and undulate. Leaves 15–33 × 6–16 cm., oblong to obovate-oblong, varying elliptic, with an acumen to 2(–4) cm. long, base cordate, varying rounded, rarely cuneate, margin entire; main veins and reticulum prominent beneath; glabrous or nearly so above except for the pubescent main veins, venation beneath thinly to densely pubescent, hairs colourless, straight or undulate, some on main veins stout and with hooked tips; lateral veins 11–20 pairs, curved, basal 2–3 pairs crowded; intercostals parallel or reticulate; deep green above, paler beneath, drying red-brown to blue-grey above, pale or reddish brown beneath, venation usually concoloured; petiole 8–15 mm. long.

Inflorescences solitary or paired in leaf-axils, the male heads also on short shoots on older wood. *At anthesis: male head* 12–32 × 10–15 mm., obovoid (rarely subglobose); perianths 2- or 3-lobed, divided nearly to the base, 0.5 mm. long; stamen 0.8 mm. long, filament flattened, tapering above, anther-cells ellipsoid, 0.15 mm. long; bracts stoutly stalked, heads peltate, to 0.4 mm. across, these and perianths sparsely ciliate; peduncle (15–)20–40 × 2 mm., indumentum as twigs; *female head* with styles exerted to 0.5 mm. through a dense covering of peltate bracts. *Syncarp* to 3 cm. across, subglobose, shallowly lobed, yellowish white, drying brown, the surface smooth, very shortly pubescent, with numerous persistent bracts; wall c. 2 mm. thick; proximal region of perianths free, fruiting perianths c. 4–6, thin-walled, “seeds” (endocarps) subellipsoid, 12 × 9 mm.; core c. 8 mm. across; peduncle (40–)70–80 × 2.5 mm., indumentum as twigs.

VERNACULAR NAMES: *cubi*, *anubing*. USES: provides a hard timber; the wood of other species of subg. *Pseudojaca* in the Philippines is sold under the same vernacular names.

DISTRIBUTION: in forests to 2500 ft.; northern and central Philippine Islands.

Philippine Islands. MINDORO. *Medina* FB 24178 (A, ♀). Mansalay: Barrio Manual, *Sulit* PNH 17175 (K, L, PNH, ♂); Mt. Yagaw, *Conklin* PNH 17464 (K, PNH, ♀). LUZON. *Ahern* 119 (BO, ♂ ♀), 786 (BO, ♀). Abra: Manabo, *Paraiso* FB 31103 (SING, ♂). Mountain Province: Kalinga Subprov., Lubuagan, *Celestino* PNH 7846 (A, ♂ ♀). Benguet: *Leano* FB 24712 (US, ♀). Isabel: San Mariano, *Clemens* 17032 (C), *Ramos & Edano* BS 46810 (C, SING, ♂ ♀). Nueva Viscaya: near Dupax, *McGregor* 11495 (C, SING, ♂). Zambales: Mt. Pinatubo, *Fox* PNH 4677 (PNH). Bataan: *Alambra* FB 25303 (SING, ♂). Nueva Ecija: *Alvarez* FB 22143 (L). Bulacan: Angat, *Vidal* 3841 (K, ♀). Rizal: *Ahern* FB 2905 (BO, K, P, SING, ♂, ♀), *Maneja* FB 23978 (A, BO, L, ♂), *Reillo* BS 15173 (BO, L, P, ♂, ♀); Antipolo, *Merrill* 1680 (K, ♂), *SB* 254 (A, BM, BO, GH, K, L, P, ♂); Bosoboso, *Merrill* 2822 (A, BM, K, ♀); Montalban, *Loher* 6948 (K, ♂); Mt. Angilog, *Lopez* FB 42035 (A, BM, K, SING, ♂, ♀). Laguna: Los Banos, *Elmer* 8175 (BO, K, ♂), *Holman* 93 (A, ♂); Los Banos, Mt. Makiling, *Banaga*

PNH 33385 (L, ♂), *Elmer* 18467 (A, BM, K, L, ♂), *Rivera* PNH 9481 (BM, L, PNH, ♂), *Sulit & Paa* 38 (A, ♀); Santa Maria, Maritac, *Curran* FB 10040 (BO). Tayabas: *Cailipan* FB 26019 (BO, L, ♂, ♀), *Manuel* FB 27456 (P); Ainoboan, *De Mesa & Rosario* FB 22777, Sept. 1913 (K, US, ♀); Langumanoc, *Ware* FB 7 (BO, ♂, ♀); Lucban, *Elmer* 9163 (A, BO, K, L, ♂). Camarines: *Alambra* 28085 (A, ♀), *Curran* FB 10426 (BO, ♂); Mt. Bagacay, *Ramos & Edano* BS 33922 (A, K, ♂, ♀); Mt. Isarog, *Curran* FB 10444 (BO, ♂). Sorsogon: *Curran* FB 10523 (BO, ♂); Irosin, Mt. Bulusan, *Elmer* 14424 (A, BM, K, L, ♂, ♀), 14458 (A, BM, K, L, ♀). MARINDUQUE. *Rosenbluth* BS 12152 (BO, ♂). CATANDUANES. *Ramos & Edano* BS 75302 (SING, ♂, ♀). SIBUYAN. Magellanes, Mt. Giting-Giting, *Elmer* 12332 (A, BM, BO, K, L, ♂). MASBATE. *Merrill* 3078 (A, BM, K, P, ♀). TICA0. *Vidal* 3840 (A, K, ♂). CEBU. *Cuming* 1784, 1841 (BM, CGE, K, P, ♂). NEGROS. *Cardona* FB 24219 (A, US, ♀), *Everett* 7301 (BO). Occidental: *Danao* FB 15036, *Everett* 4305 (BO, ♂); Cadiz, *Oliveros* FB 29891 (NY, ♂). Oriental: Dumaguete, Cuernos Mts., *Elmer* 9890 (A, BM, BO, K, L, ♂). PANAY. Ilo-ilo, *Vidal* 596 (K, L, ♂).

Blanco's description of *Artocarpus ovatus* is clearly identifiable, but his name was reduced by Fernandez-Villar (1880) to *A. cumingiana* Tréc. (the misspelling of which as "*cummingiana*" arose from a misprint on the labels in the Paris herbarium). Merrill (1905) also used Trécul's name since he found (presumably from "Index Kewensis") that Noronha had published an *Artocarpus ovatus* in 1790 and was unaware that the latter was a *nomen nudum*.

Artocarpus ovatus is quite distinct from the other Philippine species of subg. *Pseudojaca* in its long-pedunculate, relatively small inflorescences. Nevertheless, it has frequently been confused with *A. fretessii*. Under the latter are given characters distinguishing these two species and *A. subrotundifolius*, another pubescent-leaved species which occurs in the Philippines.

30. *Artocarpus tonkinensis* A. Chev. ex Gagnep. Bull. Soc. Bot. Fr. 73: 90. 1926; Gagnep. in Lecomte, Fl. Gén. Indoch. 5: 737. 1928; Merr. Lingnan Sci. Jour. 6: 275. 1930, 7: 303. 1931; Metcalf, Jour. Arnold Arb. 26: 198. 1945. Syntypes, Indochina, *Balansa* 2486, *Castellini* 111, *Poilane* 1859, *Service Forestier* s.n. (P); lectotype, *Poilane* 1859 P).

Artocarpus tonkinensis A. Chev. Bull. Écon. Indo-Chine 20(no. 132): 861. 1918, *nomen nudum*.

Artocarpus sp., Merr. Lingnan Sci. Jour. 5: 63. 1928.

Trees, height to 15 m. *Twigs* 1.5–2.5 mm. thick, reddish brown, short-pubescent or puberulent, hairs usually appressed and crisped. *Leaves* 9–23 × 4–10 cm., elliptic, obovate- or oblong-elliptic, or obovate-oblong, acuminate, base cuneate or rounded, margin entire; juvenile leaves with margin shallowly dentate towards apex; main veins and reticulum prominent beneath; glabrous above or the main veins puberulent, venation beneath thinly pubescent, hairs colourless and undulate; lateral veins 6–9

pairs, curved; intercostals parallel; deep green above, paler beneath, usually drying greyish green with reddish main veins and reddish or straw-coloured reticulum; petiole 4–12(–20) mm. long.

Inflorescences solitary in leaf-axils. *At anthesis*: *male head* 10–25 × 8–15 mm., obovoid to ellipsoid; perianths of 2 or 3 free segments 0.5 mm. long; stamen 0.7 mm. long, filament tapering above, anther-cells ellipsoid, 0.2 mm. long; bracts slenderly stalked, heads peltate, to 0.4 mm. across, these and perianths short-ciliate; peduncle (5–)7–12 × 1.5 mm., velutinous; *female head* with styles exerted to 0.7 mm. through a dense covering of peltate bracts. *Syncarp* to 6.5 cm. across, subglobose, shallowly lobed, yellow, drying rufous, the surface smooth, pubescent, with scattered persistent bracts; wall 5–8 mm. thick; proximal region of perianths fused, fruiting perianths 6–12, thin-walled, “seeds” (endocarps) subellipsoid, 12–15 × 9–12 mm.; core c. 10 mm. across; peduncle 30–40(–65) × 2.5 mm., velutinous.

USES: cultivated for the edible fruit.

DISTRIBUTION: in forests to 4000 ft.; Indochina and southern China.

Indochina. CAMBODIA. *d’Alleizette*, 1909 (P, ♂). ANNAM. Bu Khang, near Vinh, *Poilane* 16644, 16647 (P, ♀). Thanh Hoa Prov.: Na bam, *Poilane* 1859 (K, P, ♂). TONKIN. Bac-giang Prov.: Bac le, *Serv. For.* (P, ♀). Ha-coi: Sai Wong Mo Shan, *Tsang* 30266 (A, ♂); Taai Wong Mo Shan, *Tsang* 29321 (A, ♂). Song Hoa, *Castellini* 111, Oct. 1905 (P). **China.** YUNNAN. Szemao, *Henry* 13015 (A, K, ♂). KWEICHOW. Bua-li, Chenfeng, *Teng* 91028 (A, ♀). KWANGSI. Ping Nam Hsien, *Wang* 40423 (A, ♀). KWANTUNG. Fan Ch’eng district, Kung P’ing Shan, *Tsang* 26749 (A, ♂); Sunyi district, Sie River, *Tsiang Ying* 2677 (K, SING, ♂). HAINAN. *Wang* 33671 (A, P, ♂, ♀); Ching Mai district, Pak Shik Ling, *Lei* 830 (A, K, L, SING, ♀); Lai area, Hung Mo Shan, *Tsang & Fung* 295 (A, BM, K, NY, P, ♂, ♀), 661 (K, NY, US, ♂); Lam Ko district, Siu Shui Hang, Lin Fa Shan, *Tsang* 250 (A, BM, K, ♂); Ling Shui district, Chim Shan, Fan Maan Ts’uen, *Fung* 20192 (A, BM, K, NY, P, US, ♂); Lokwui, *How* 72358 (A, P, ♂); Ngai district, Chiu Sam Tsuen, *Lau* 395 (A, BM, K, P, ♂); Po-ting, *How* 72008 (A, BM, P, ♂), 72552 (A, BM), 73076 (A, P, ♂), 73252 (A, SING, ♂), 73471 (A, BM, P, ♀); Taam-chau district, Shan Tong To, *Tsang* 706 (A, BM, K, ♀); Wik Tsok Man, *McClure* 9752 (K); Yaichow, *Liang* 62632 (A, NY, US, ♀). **Cultivated.** INDOCHINA. Tonkin, Ké Só, *Balansa* 2486, May 1886 (P, ♀). CHINA. Kwangtung, Loh Kong Tung, Taai Shaan, *McClure* 13564 (K, P).

Chevalier, in 1918, gave details of the wood only under the name *Artocarpus tonkinensis*, and this was not validly published until 1926, when Gagnepain supplied a botanical description. In the same area there are two other pubescent-leaved species with which *A. tonkinensis* might be confused. In *Artocarpus lakoocha*, the styles are exerted to 1–1.5 mm., the peduncles are shorter (the male to 5 mm., the female to 15(–25) mm.), the leaf has more numerous lateral veins (9–18 pairs), and the petiole is longer ((10–)15–45 mm.). In *A. petelotii* the interfloral bracts are clavate, and the surface of the syncarp hence more or less papillate, while the indumentum of the twigs and leaves is longer and not crisped.

31. *Artocarpus gomezianus* Wall. ex. Tréc. Ann. Sci. Nat. Bot. III. 8: 118. 1847, "*Gomeziana*"; Kurz, For. Fl. Burma 2: 433. 1877; King in Hook. f. Fl. Brit. Ind. 5: 544. 1888; King, Ann. Bot. Gard. Calcutta 2: 15. 1889, pro parte, excl. *t. 14A* et spec. *King 4189, 5078, 7535, 8838, Maingay 1486* (*A. nitidus* ssp. *griffithii*) et *Wallich 4658A* (*Ficus callophylla* Bl.); Parkinson, For. Fl. Andaman Is. 253. 1923; Kanjilal et al. Fl. Assam 4: 269. 1940. Holotype, Burma, *Wallich 4660* (G, not seen, photograph in A); isotypes (CAL, CGE, K).

Artocarpus gomeziana Wall. Cat. no. 4660. 1831, nomen nudum.

Artocarpus petiolaris Miq. Fl. Ind. Bat. Suppl. 422. 1861. Holotype, Sumatra, *Teysmann HB 752* (U); isotype (BO).

Artocarpus pomiformis Teysm. & Binnend. Natuurk. Tijdschr. Ned. Ind. 25: 400. 1863; Koord. & Val. Bijdr. Boomsoort. Java 11: 23. 1906; J. J. Smith, Ic. Bogor. 3: 87. *t. 235*. 1907; Backer, Beknopte Fl. Java 6: 15. 1948.

Artocarpus lakoocha Roxb. var. β *gomeziana* (Wall.) Trimen, Handb. Fl. Ceylon 4: 99. 1898, quoad nomen, non quoad plantam.

Artocarpus masticata Gagnep. Bull. Soc. Bot. Fr. 73: 88. 1926; Gagnep. in Lecomte, Fl. Gén. Indoch. 5: 739. 1928. Holotype, Annam, *Poilane 5492* (P); isotypes (K, P).

ssp. *gomezianus*

Evergreen trees, height to 40 m., bark dark grey-brown. *Twigs* 2–4 mm. thick, smooth or finely rugose, appressed-puberulent, soon glabrescent. *Leaves* 11–25 \times 7–16 cm., oblong, varying to elliptic, short-acuminate, base broadly rounded, varying to cuneate or subcordate, glabrous, margin entire or shallowly crenate; main veins prominent beneath; lateral veins 10–15(–20) pairs, straight or slightly curved; intercostals parallel; deep green above, paler beneath, main veins greenish white, usually drying pale greenish or greyish brown with straw-coloured main veins; petiole 15–30 mm. long.

Inflorescences solitary in leaf-axils. *At anthesis: male head* 10–25 mm. across, obovoid to subglobose; perianths 2- or 3-lobed, divided nearly to the base, 0.5 mm. long; stamen 0.6 mm. long, filament stout, abruptly contracted above, anther-cells globose, 0.2 mm. long; bracts stoutly stalked, heads narrowly peltate, to 0.4 mm. across, these and perianths with sparse, short hairs; peduncle 7–17 \times 1 mm., puberulent; *female head* with peltate bracts being shed or already fallen and styles exerted to 0.3 mm. through perforations in the surface. *Syncarp* to 8 cm. across, subglobose, yellow with pink flesh, drying brown or black, the surface smooth, velutinous; wall c. 8 mm. thick; proximal region of perianths free, fruiting perianths several, fleshy, "seeds" (indurated endocarps) ellipsoid, 12 \times 10 mm.; core c. 20 mm. across; peduncle 15–45 \times 8 mm., velutinous.

USES: there is one record of the fruit being edible (Poulo Condore, *Harmand 700*); the roots are chewed with betel (Annam, *Poilane 5492*).

DISTRIBUTION: in evergreen and semi-evergreen forest to 2000 ft. in regions with a distinct dry season; Assam ?, Burma, Andaman Islands, Siam, southern Indochina, Malaya, Sumatra, Java (western and central provinces), Philippine Islands (Cagayan Sulu, ? introduced).

Burma. Pinmona [? Pyinmana], *Huk*, Aug. 1890 (P, SING). TENASSERIM. Tavoy: *Wallich* 4660 (leg. Gomez), Nov. 1827 (CAL, CGE, K, ♂). Mergui: Victoria Point, *Po Khant* 11343 (DD, ♀). Andaman Islands. *King* 416 (K, ♀). **Siam.** Ko Kahdat, *Schmidt* 556 (C, ♂); Muak Tek, Sanaburi, *Kerr* 9064 (BM, ♂); Chantaburi, *Jeppeson*, May 1947 (C); Sraburi, Phu Khae, *Smitinand* 1549 (CGE). PENINSULAR SIAM. Bangtapan, *Kerr* 1436 (BM, ♀); Krabi, Ao Luk, *Kerr* 18608 (BM, ♂); Surat, Kaw Tao, *Kerr* 12700 (BM, K, L, P, ♂); Trang, Chum Het, *Kerr* 15214 (BM, K, P, ♀); Trang, Thap Tiang, *Fox* 3845 (SING, ♂, ♀). **Indochina.** CAMBODIA. *Béjeaud* 640 (NY, P, ♀). ANNAM. Nhatrang Prov., Phu-hu, between Nhatrang and Ninhua, *Poilane* 5492, Jan. 1923 (K, P, ♂). POULO CONDORE. *Harmand* 700 (P, ♀).

Malaya. Novadens Hill, *Maingay* 1486 (GH, K, L, ♂). KEDAH. Baling, *Abdullah* KEP 27356 (KEP); Kokmoi For. Res., *Hassan* KEP 42427 (KEP, ♀); P. Songsong, *Curtis*, June 1890 (P); Sik, *Mohamed* KEP 11327 (KEP, ♀). KELANTAN. Tumpat, *Corner* SFN 33529 (SING, ♂), *Ngadiman* SFN 33698 (SING, ♀). PAHANG. Bentong, Clough For. Res., *KEP* 78746 (KEP); Bentong, Ulu Benus, *Symington* KEP 51821 (KEP, ♀). JOHORE. Sungei Rhu Riba, Jason Bay, *Corner* (SING, ♂). LANKAWI ISLANDS. P. Butong, *Curtis* 906 (K, SING, ♂). PENANG. Road to Balik Pulau, *Curtis* 2462 (K, SING, ♂). SINGAPORE. *Didrichsen* 4412 (C, ♂). P. TIOMAN. Telok Paya, *Nur* SFN 21742 (BO, KEP, SING, ♂).

Sumatra. ATJEH. Seulimeum, Lam Temot, *bb* 5876 (BO, L). TAPANULI. Padang Lawas, Purbasinamba, *bb* 6186 (BO). WEST COAST. *Teysmann* HB 798 (BO, U, ♀); Baros, *Teysmann* HB 721 (L), 752 (BO, U, ♂). EAST COAST. Huta Padang Estate, near Kisarin, *Krukoff* 225 (BO, ♂). BENKULEN. Redjang, Sukamarindu, *bb* 8861 (BO); Redjang, Tabah Penandjung, *bb* 2822 (BO, L). P. WEH. Baloken, *Koorders* 10578, 10579, 10580 (BO, ♀).

Java. WEST JAVA. Buitenzorg: Djampang Kulon, Tjikankung, Tjidjaringao, *NIFS* Ja 1250 (BO, ♀). Preanger: Palabuanratu, Sukabumi, *Koorders* 8687 (BO, ♂). CENTRAL JAVA. Pekalongan: Mayasari, *Burger* 3340 (BO, ♂); Prupuk, *Wind* 26 (BO, L, ♀). Semarang: *Koorders* 9419 (BO, L); Kedungdjati, *Koorders* 8674 (BO, L), 8676 (BO, L, ♂), 8677 (BO, ♂, ♀), 8690 (BO, L, ♂), 25251 (BO, L, P, ♀), 25322, 26139 (A, BO, L), 33701 (BO, K, L, ♂, ♀); Kedungdjati, Deras, *Koorders* 8675 (BO, L, ♂, ♀), 8691, 9271, 25319 (BO, L); Kedungdjati, near Gunong Kenting, *Koorders* 24957 (BO, L, ♂); Kedungdjati, Prizi, *Koorders* 25475 (BO, L); Kedungdjati, Pungge, *Koorders* 8678 (BO, P), 8679 (BO, L); Kedungdjati, Trimze, *Koorders* 8689, 8692 (BO, L, P), 8693 (BO); Telawa, *Jansen* 4637 (BO, ♂). Jogjakarta: Zuidergebergte, *Teysmann* (BO).

Philippine Islands. CAGAYAN SULU. *Antonio* FB 30634 (NY), *Merrill* 5304 (BO, L, NY, P, US, ♂, ♀); Buluan Ranch, *Santos* 4772 (L, ♂, ♀). **Cultivated.** JAVA. Bogor, Hort. Bot., *HB* 7289 (BO, P), *VIII B* 41 (L).

The synonyms listed above all refer to *Artocarpus gomezianus* ssp. *gomezianus*, but the name *A. lakoocha* Roxb. var. *gomeziana* (Wall.) Trimen was used by Trimen and later authors in the sense of *A. gomezianus* ssp. *zeylanicus*.

The variety *griffithii*, based on Malayan material, which was described under *Artocarpus gomezianus* by King in 1888 and 1889, is here transferred to *A. nitidus* as a subspecies; the distinguishing characters and the confusion that has occurred between the entities in Malaya are discussed there. All other references in the literature to *A. gomezianus* as occurring

in Malaya are based on *A. nitidus* ssp. *griffithii*. *Artocarpus gomezianus* ssp. *gomezianus* is mainly restricted to the north of Malaya and the east coast, where there is a distinct dry season, although a single specimen has been seen from Singapore.

The distribution of ssp. *gomezianus* in western Malaysia is apparently somewhat discontinuous, corresponding to its climatic requirements. However, no significant variation is shown within this subspecies and the maintenance of *A. pomiformis* Teysm. & Binnend. as a distinct species in Java presumably arose from its comparison with King's description and plate, which were largely (the latter solely) based on material which should have been referred to his var. *griffithii*. The subspecies is apparently absent from Borneo and it is possible that the specimens from Cagayan Sulu were taken from a tree, or trees, that had been introduced, although there is no evidence for this. Kanjilal *et al.* (1940) also record *A. gomezianus* for the Lakhimpur district of Assam.

ssp. *zeylanicus* Jarrett, ssp. nov.

Artocarpus lakoocha auct. non Roxb., Thwaites, Enum. Pl. Zeylan. 262. 1861; Beddome, For. Man. 219. 1873, pro parte; Trimen, Handb. Fl. Ceylon 4: 99. 1898; Cooke, Fl. Bombay 2: 657. 1907, p.p.; Bourdillon, For. Trees Travancore, 371. 1908, p.p.; Talbot, For. Fl. Bombay 2: 529. 1911, p.p., incl. fig. 533; Fischer in Gamble, Fl. Madras 3: 1369. 1928, p.p.; Macmillan, Trop. Pl. & Gard. ed. 4. 250. 1935; Abeyes. & Rosayro, Checklist Ceylon, 48. 1939; Watanabe, Ic. Econ. Pl. S. Asia 2: 527. 1945.

Artocarpus lakoocha Roxb. var. β *gomeziana* (Wall.) Trimen, Handb. Fl. Ceylon 4: 99. 1898, quoad descr. et spec. cit.

Artocarpus gomezianus Tréc., Worthington, Ceylon Trees. 420. 1959.

Differt ab typo *ramulis junioribus* saepe appresse pubescentibus, pilis undulatis, cinereis, raro flavis, *foliis* ovatis, ovati-lanceolatis, ovati-ellipticis vel elliptici-oblongis, acumine ad 2 cm. longo, basi subcordata, late rotunda vel late cuneata, costa nervis lateralibusque subtus prominentibus, venulis prominulis, pubescentibus, pilis canescens undulatis, vel glabris, nervis lateralibus utrinque 10–13, petiolo (7–)13–25(–30) mm. longo, *capitulis masculis* 8–11 mm. diametro, globosis, pedunculis 5–18 mm. longis, *syncarpiis* 3 cm. diametro, flavis, carne flava, pedunculis 13–15(–20) mm. longis.

HOLOTYPE: Madras, *Wight 2717* (K); isotypes (C, GH, L).

VERNACULAR NAMES: *otamb*, *watamba*, *lowi*, southern India; *kanagana*, Ceylon. USES: the fruit is eaten and the tree appears to be planted in both Ceylon and southern India.

DISTRIBUTION: in evergreen forests to 3000 ft.; in the wetter parts of the Western Ghats and Ceylon.

India. Cutahey, *Buchanan*, Mar. 1801 (BM, ♀); Malabar, Concan, *Stocks & Law* (GH, P); Kanara, Yacombi, *Cooke*, Feb. 1893 (K, ♂, ♀). BOMBAY. North Kanara, Karwar, *Fernandes 119* (A, ♂); Sanklu [? Sangli], *Stocks* (K, ♂); Supa, *Fernandes 1143* (A, BLAT, ♀), *Ritchie 1381* (K, ♂). MYSORE. Marnhalli,

Meebold 8435 (K, ♂). COORG, Near Mercara, *Hohenacker 557* (BM, C, K, L, ♂). MADRAS. Mangalore, *Wight 2717*, Mar. 1852 (C, GH, K, L, ♀).

Ceylon. *Macrae 692* (BM, CGE, ♂), *Thwaites CP 2232* (BM, CGE, GH, P, ♂), *2463* (K, ♂); Galle, *Champion* (CGE, ♀); Galle, Batapola, *Worthington 2462* (BM); w. of Ginganga, Hiniduma, *Worthington 2312* (BM, ♂); Kadugannawa, Kolugala, *Hancock 1379* (BM); Kadugannawa, Udawela Fort Jungle, *Worthington 1426* (BM, ♀); Narawella [= Nuwara Eliya], *Champion* (CGE, ♂); Ratnapoora, *Thwaites CP 2831* (BM, CGE, GH, K, P, ♀). Cultivated. CEYLON. Mellue, *Gardner* (K, ♀); Peradeniya, Hort. Bot., *Worthington 6744* (CGE, ♀), *Worthington*, Feb. 1955 (CGE, ♂).

Artocarpus gomezianus ssp. *zeylanicus*, which is described here from the Western Ghats and Ceylon, has not previously been distinguished from *A. lakoocha*. However, within the Indian subcontinent, the latter appears to be restricted, as an indigenous tree, to the north and east. The new entity is differentiated by the smaller, globose head (8–11 mm. diameter *vs.* 12–25 × 10–18 mm.) and the longer peduncle (5–18 × 1 *vs.* 2–5 × 2 mm.) of the male inflorescence, by the smooth surface of the female head at anthesis and the shorter exertion of the styles (to 0.3 mm. *vs.* 1–1.5 mm.) and, apparently, by the smaller size and smoother surface of the mature syncarp. In addition, the collections seen from India have rather distinctive ovate-lanceolate leaves, which are densely greyish pubescent beneath. In those seen from Ceylon, on the other hand, the leaves vary to elliptic-oblong in outline and these and the twigs are often subglabrous, so that specimens are not clearly distinguishable from *A. gomezianus*, *sensu stricto*. Since the dimensions of the male inflorescences, although usually smaller in the western entity, also overlap, it seems best to treat the latter as a subspecies of *A. gomezianus*. The nature of the variation found in Ceylon is not entirely clear, but it appears to occur between different trees and not merely to represent sapling and adult stages. Subglabrous collections from Ceylon were identified with *A. gomezianus* by both Thwaites and Trimen, and were described by the latter under the name *A. lakoocha* var. *β gomeziana*.

32. *Artocarpus dadah* Miq. Fl. Ind. Bat. Suppl. 420. 1861, Ann. Mus. Lugd.-Bat. 3: 213. 1867; S. Moore, Jour. Bot. 63, Suppl. 112. 1925; Corner, Gard. Bull. Singapore 10: 282. 1939, Wayside Trees, 653. 1940. Holotype, Sumatra, *Teysmann HB 4391* (U); isotypes (BO, K, L).

Artocarpus mollis Miq. Fl. Ind. Bat. Suppl. 420. 1861, non Wallich, 1831 (nomen nudum), Ann. Mus. Lugd.-Bat. 3: 211. 1867. Holotype, Sumatra, *Teysmann HB 4211* (L); isotype (BO).

Artocarpus rufescens Miq. Fl. Ind. Bat. Suppl. 420. 1861; Renner, Bot. Jahrb. 39: 370. 1907. Holotype, Sumatra, *Teysmann HB 3793* (U); isotypes (BO, K, L).

Artocarpus tampang Miq. Fl. Ind. Bat. Suppl. 421. 1861, Ann. Mus. Lugd.-Bat. 3: 211. 1867. Holotype, Sumatra, *Teysmann HB 3997* (U); isotypes (BO, K, L).

- Ficus tampang* Miq. Fl. Ind. Bat. Suppl. 425. 1861. Holotype, Sumatra, *Teysmann HB 710* (U); isotype (BO).
- Ficus inconstantissima* Miq. Fl. Ind. Bat. Suppl. 431. 1861. Holotype, Sumatra, *Teysmann HB 3529* (U); isotypes (BO, CAL, L).
- Artocarpus inconstantissima* Miq. Ann. Mus. Lugd.-Bat. 3: 211. 1867.
- Artocarpus dadah* Miq. var. *pubescens* Miq. Ann. Mus. Lugd.-Bat. 3: 213. 1867. Holotype, Sumatra, *Korthals s.n.* (L).
- Artocarpus erythrocarpa* Korthals ex Miq. Ann. Mus. Lugd.-Bat. 3: 213. 1867, pro syn.
- Artocarpus lakoocha* Roxb. var. *malayana* King in Hook. f. Fl. Brit. Ind. 5: 544. 1888; King, Ann. Bot. Gard. Calcutta 2: 15, excl. spec. *De Fretes*, Amboina. Syntypes, Malaya, King 1640, 4187, 5653 (CAL, not seen; duplicates examined, K, etc.).
- Artocarpus reniformis* Becc. For. Borneo, 631. 1902. Syntypes, Sarawak, *Beccari PB 3107, 3551* (FI); lectotype, *Beccari PB 3107* (FI).
- Artocarpus peltata* Merr. Jour. Str. Br. Asiat. Soc. 85: 166. 1922. Holotype, British North Borneo, *Villamil 168* (PNH, not seen, photograph in A); isotype (BO).
- Artocarpus lakoocha* auct. non Roxb., King in Hook. f. Fl. Brit. Ind. 5: 543. 1888, pro parte; King, Ann. Bot. Gard. Calcutta 2: 14. 1889, p.p., quoad spec. *Griffith 4666, Maingay 1479*; Ridley, Fl. Malay Penin. 3: 355. 1924.
- Artocarpus dasyphylla* auct. non Miq., Merr. Pl. Elmer. Born. 46. 1929.

Deciduous trees, height to 35 m. Twigs 2.5–5 mm. thick, rugose, densely short-pubescent, hairs red-brown or fulvous, straight, varying undulate, a few sometimes longer and hooked at tip. Leaves 10–30 × 5–17 cm., obovate- or elliptic-oblong, varying to ovate-elliptic, acute or acuminate, base rounded, varying to broadly cuneate or shallowly cordate, margin entire; juvenile leaves with the lamina pinnatifid or reduced to a narrow sinuate wing along the midrib; main veins prominent beneath, reticulum less so; glabrous above, or nearly so, except for the short-pubescent main veins, venation beneath densely to thinly pubescent, hairs rufous to colourless, patent, straight or slightly undulate (in Borneo, except British North Borneo, hairs often inserted along edges of reticulum and appressed over areolae), subdeciduous, the lower surface scabrescent, varying persistent; lateral veins 10–20 pairs, curved; intercostals parallel; dark green, drying dark or reddish brown to blue-grey above, pale or reddish brown beneath, the areolae sometimes greyish and, with the colourless hairs, appearing glaucous, venation concolorous or often nigrescent; petiole 5–20 mm. long.

Inflorescences solitary in leaf-axils. *At anthesis: male head* 8–15 mm. across, globose or pulvinate; perianths of 2 or 3 free segments 0.3 mm. long; stamen 0.5 mm. long, filament cylindrical, abruptly contracted above, anther-cells globose, 0.2 mm. long; bracts stoutly stalked, heads narrowly peltate, to 0.4 mm. across, these and perianths short-ciliate; peduncle 8–15 (Borneo, 8–20) × 1 mm., indumentum as twigs; *female head* with peltate bracts already fallen (densely covering young head) and styles exerted to c. 0.5 mm. through low papillae. *Syncarp* to c. 5 cm. across, subglobose, green with deep pink flesh, the surface smooth, velutinous; wall c. 7 mm. thick; proximal region of perianths free, fruiting perianths sev-

eral, fleshy, "seeds" (indurated endocarps) ellipsoid, 12×8 mm.; core c. 15 mm. across; peduncle 12–25(–40) (Borneo, 23–45(–80)) \times 4 mm., indumentum as twigs.

VERNACULAR NAMES: *tampang* (Malay), Malaya, Sumatra, Borneo; *dadah*, Sumatra (recorded only twice).

DISTRIBUTION: in evergreen forest to 3000 ft.; Tenasserim, Siam, Malaya, Sumatra, Simalur, Banka, Borneo.

Lower Burma. TENASSERIM. Mergui: Mergui range, *sine nom.* 421 (DD, ♀); Thamihla Chaungbya, *Po Khant* 13252 (K). Siam. Phetchbun, Lom Kao, Ban Phuhee, *Smitinand* 2587 (CGE). PENINSULAR SIAM. Kaw Pa-ngan, *Kerr* 1187 (BM, ♀); Ranawng, Nok Nang, *Kerr* 16835 (BM, ♀); Satul, Klawng Ton, *Kerr* 14594 (BM, ♀); Trang, Chawng, *Kerr* 15170 (BM, ♂), *Put* 2371 (CGE); Trang, Kuantan, *Kerr* 17488 (BM, ♀); P. Terutao, *Kerr* 14229 (BM, ♂).

Malaya. KEDAH. *Meh* CF 21885 (SING); Gunong Raya, *Dolman* CF 21496 (SING, ♀). PROV. WELLESLEY. Krian, *Ridley* 9385 (CAL, SING, ♀); Kubang Ulu, *Curtis*, June 1890 (SING, ♀); Tasek Gelugur, *Ridley* 6978 (BM, ♂), 6980 (SING, ♂, ♀). PERAK. *Scortechini* 37b (L), *s.n.* (BM, K, P, SING, ♂, ♀); Larut, *King* 2678 (K, L, ♀), 4187, Apr. 1883 (K, ♀); Larut, Chanderang, *King* 5653, Mar. 1884 (BM, K, L, P, ♀); Larut, Goping, *King* 6098 (BM, BO, K, P, ♀); Sungei Larut, *Wray* 2479 (SING, ♂); Trong, *Wray* 3176 (SING, ♂, ♀); Waterfall Hill, *Wray* 2560 (SING, ♀). KELANTAN. *Walton* KEP 32681 (KEP). TRENGGANU. Bukit Kajang, Ulu Bendol, Kemaman, *Corner*, Nov. 1935 (SING). PAHANG. Cameron Highlands, *Batten Pooll*, Nov. 1939–Jan. 1940 (SING); Gali near Raub, *Burkill & Haniff* SFN 16918 (SING, ♂); Kuantan, *Lamban* CF 2707 (K, SING, ♀); Sungei Rompui, *Bidin* CF 15658 (SING, ♀). SELANGOR. Klang Gates, *Murdoch* 57 (BM, ♂); Kuala Lumpur, *Mohamor*, June 1890 (SING, ♀); Kuala Lumpur, Weld Hills For. Res., *Ahmad* CF 2949, 5025 (SING, ♀), *Guard* CF 863 (SING, ♂). NEGRI SEMBILAN. Triang Res., *Tahir* CF 607 (SING, ♀). MALACCA. *Maingay* 1479 (BO, GH, K, L, ♂, ♀); Ayer Punnas, *Griffith* 4666 (K, P, ♀). JOHORE. Kluang For. Res., *Holttum* SFN 9204 (K, SING, ♂); Sungei Berassau, Mawai-Jemalaung road, *Corner*, Jan. 1936 (SING); Sungei Kayu, Mawai-Jemalaung road, *Kiah* SFN 32185 (BO). LANKAWI ISLANDS. *Wyatt-Smith* KEP 71197 (K, KEP, ♂, ♀); near Kuah, *Curtis* (SING); P. Butong, *Curtis* 906 (K, SING, ♀). PENANG. *King* 1532 (K, ♂), 1640, Aug. 1881 (BO, CGE, K, ♀), *Wallich* 4658B (CGE); Government Hill, *Curtis* 1222 (SING, ♂); West Hill, *Curtis* 1251 (SING, ♀), 1743 (CAL, SING, ♂). SINGAPORE. *Cantley* 3086 (SING, ♂); Bukit Kalang, *Ridley*, 1892 (SING); Bukit Timah, *Ngadiman* SFN 34682 (A, BO, K, P, SING, ♂), *Ridley* 4722 (BM, K, L, P, SING, ♀); Chan Chu Kang, *Ridley* (SING, ♀); Changi, *Ridley* 3358 (CAL, K, SING, ♂, ♀), 4724 (K, ♂); Government House Domain, *Best* SFN 25995 (SING, ♀); MacRitchie Reservoir, Thompson Road end, *Corner*, June 1937 (SING); Mandai road, *Corner* SFN 32545 (K, SING), *Ridley* 4130 (BM, SING, ♀); 11½ miles Mandai road, by shore of Seletar Reservoir, *Sinclair*, Mar. 1953 (K); Pulau Ubin, *Ridley* 4721 (SING, ♀); Reservoir Jungle, *Corner*, Feb. 1937 (SING, ♂).

Sumatra. *Grashoff* 1032b (BO, L, ♀), *Korthals* (L, ♀). TAPANULI. Sibide, Parduaan, *Rahmat si Boeea* 6096 (L, ♂); Padang Lawas, Purbasinamba, *bb* 6202 (BO). WEST COAST. Fort de Kock, *Teysmann* 710 (BO, U); Mt. Sago near Pajahkumbuh, *Meijer* 7197 (L); Priaman, *Diepenhorst* 2186 (P). EAST COAST. Amplas, *Jochems* 3168 (BO); Asahan, Aek Salabat, *Rahmat si Boeea* 9622 (A, L, ♂); Asahan, Huta Padang, *Krukoff* 4368 (A, BO, L, NY, SING, ♂); Asahan,

Simpang Toba, *bb* 6344, 7184 (BO, L); Beneden Langkat, Alur Gusta, *bb* 16375 (A, BO, L); Langkat, Sungei Sedapan, *bb* 9364 (BO); Lubuk Mambang, *Koorders* 10453 (BO, ♀); Sibolangit, *Lörzing* 5151 (BO, L, ♀). DJAMBI. Danau Lama, *bb* 13640 (BO, ♀). PALEMBANG. Banjuasin and Kubustreken, *NIFS T* 65 (BO, L, U, ♀), 777 (BO, K, L, SING, ♀); Banjuasin, Bajunglintjir, *NIFS T* 902 (BO, L, ♂); Batu Radja, *Teysmann HB* 3529 (BO, CAL, L, U); Dermo Enim, *Teysmann HB* 3793 (BO, K, L, U, ♂, ♀); Komering Ulu, *Grashoff* 579 (BO); Lematang Ilir, Darmo, *bb* 8720 (BO); Lematang Ilir, Gunong Megang, *NIFS T* 889 (BO, L, ♂), 1207 (BO); Lematang Ulu, *Grashoff* 179 (BO, L), *Lambach* 1200 (BO, L, ♀); Muara Dua, *Grashoff* 436 (BO, L, ♀), *Teysmann HB* 3856 (BO, P); Muara Dua, Kisau, *bb* 9234 (BO); Mulak Ulu, *Grashoff* 330 (BO, L, ♂); Pandananan, Oganulu, *Teysmann HB* 3742 (P), 3997 (BO, K, L, U); River Ruput, W. Suka Radja, *Forbes* 2948a (CAL, L); Tandjong Ning, River Bliti, *Forbes* 2789 (BM, L, SING, ♀). LAMPONGS. Kebang, *Teysmann HB* 4211 (BO, L); Mangala, *Teysmann HB* 4391 (BO, K, L, U, ♀). SIMALUR. Achmad 1259 (BO, K, L, P, SING, U, ♀); Landschap Tapah, Defajan, *Achmad* 1805 (BO, K, L, SING, ♀). BANKA. Blinju, *Teysmann HB* 7249 (BO, K, L, ♀), *Vordermans* 41 (BO, ♀); Djebus, *Teysmann HB* 7255 (C, K, L, P); Pangkalpinang, *Teysmann HB* 6842 (BO, K, L, ♀), 6856 (BO, C, K, L, P, ♂); Sungei Liat, *Teysmann HB* 7256 (L, P); Zapadong, *Teysmann HB* 3290 (P). BILLITON. Tandjungpandan, *Teysmann* (BO). RIOUW ARCHIP. P. Bintang, *Teysmann HB* 7285 (BO, K, L, P, ♀).

Borneo. SARAWAK. Kuching, *Beccari PB* 3107, Nov. 1867 (FI, K, ♀), 3551, June 1867 (A, FI, ♂); Nanga Temulan, *Daud & Tachun* 35690 (SING, ♀). WEST BORNEO. Sambas, Perigi Limus, *bb* 7064 (BO, ♀); Sungei Sambas, *Hallier* 1153 (BO, L, SING, ♂). SOUTH AND SOUTHEAST BORNEO. Martapura, Djungur, *bb* 10377 (BO, ♂, ♀); Tanah Bumbu, Kampong Baru, *bb* 13308 (BO, L), 13366 (BO, K, L, ♀). EAST AND NORTHEAST BORNEO. Balikpapan: *Lam* 3871 (L); Mentawir, *Sauveur* 97 (K, ♂, ♀). Berouw: Domaring, *bb* 18865 (A, BO, L, SING, ♂); Inaran, *bb* 12175 (BO). W. Kutei: Longbleh, *bb* 16133 (BO, L), 16145 (A, BO); Tandjong Isui, *Endert* 1945 (A, K, L, ♂, ♀); Upper Mahakam, Udjoh Bilang, *bb* 20612 (A, BO, L). E. Kutei: Loa Djanan, w. of Samarinda, *Kostermans* 6644 (L), 9970 (L, ♂, ♀); Tandjong Bangko region, near mouth of Mahakam River, *Kostermans* 7018 (L). BRITISH NORTH BORNEO. *Agama* 484 (A, K, ♀); Elphinstone prov., Tawao, *Elmer* 21110 (A, BM, K, L, ♀); Mt. Kinabalu, Dallas, *Clemens* 26322 (A, BM, K, L, ♂, ♀), 27444 (A, BO, BM, K, L, ♀); Sandakan, *Melegrito* 9044 (SING), *Ramos* 1904 (A, BM, K, L, ♂), *Villamil* 168, Mar. 1916 (BO, PNH, ♀); Sandakan, Ebpura, Beatrice Road, *Alendre A* 3252 (L, SING, ♀); Sandakan, Leila For. Res., Bukit Makara, *Wood SAN A* 3476 (A, K, L, SING, ♂).

This common and variable species was described under six different specific names by Miquel in 1861. Of these, the one chosen here is *Artocarpus dadah*. This has been the name most widely used on herbarium specimens and Corner, in 1939, correctly identified as *A. dadah* the Malayan entity which had hitherto been regarded as representing *A. lakoocha*. The latter is a species of the monsoon forest which has not been found south of the Siamese border, and the error arose from its treatment by King in his monograph. He described under *A. lakoocha* a variety *malayana*, citing three collections here referred to *A. dadah*, and giving *A. tampang* and *A. rufescens* of Miquel correctly as synonyms. However, under the type itself two further collections of *A. dadah* were listed and

the description was partly based on these. As a result, the variety was not recognized by later workers and all Malayan material was identified as *A. lakoocha*. The fourth collection cited by King under var. *malayana*, *De Fretes s.n.* from Ambon, is a sterile specimen which may be referable to *A. vrieseanus*.

The variation shown by *Artocarpus dadah* occurs chiefly in the length of the peduncles and in the indumentum. It has some geographical basis, but separation into geographical units is not possible, since the variation is continuous and is not parallel in the different characters. Collections seen from Borneo tend to have inflorescences with longer peduncles, as is indicated above in the description. In this area the indumentum of the leaves is also usually persistent, whereas elsewhere the leaves generally become subglabrous and slightly rough beneath. Some specimens from Sumatra and Malaya are, however, densely and persistently pubescent, and this character is often associated with a rather more prominent reticulum. A peculiarity found in material from Borneo (but apparently not in that from British North Borneo) is that hairs are inserted along the edges of the veins of the reticulum on the lower surface and appressed over the areolae. This is not to be confused with the minute tomentum developed from the epidermis of the areolae in some other species of subgenus *Pseudojaca*.

The characters distinguishing *Artocarpus dadah* from *A. fulvicortex* and *A. tomentosulus* are noted below under those species. The only other species occurring within its area with which *A. dadah* might be confused is *A. fretessii*, which extends into the eastern part of Borneo. This differs in the more prominent, straw-coloured reticulum of the leaves, in the paler indumentum, crisped on the twigs, and also in the smaller male inflorescences and the lobed syncarp. Characters distinguishing *A. dadah* from *A. vrieseanus* are given below.

33. ***Artocarpus vrieseanus*** Miq. Ann. Mus. Lugd.-Bat. 3: 212. 1867.

Artocarpus cumingiana auct. non Tréc., Diels, Bot. Jahrb. 67: 176. 1935.

Trees, height to 28 m. *Twigs* 2–4 mm. thick, pubescent to subglabrous, hairs red-brown to yellowish, ± appressed and crisped or undulate, varying patent and straight or hooked at the tip. *Leaves* 7–30 × 3–15 cm., obovate-oblong to elliptic or ovate-elliptic, varying narrowly oblong, oblong-lanceolate or elliptic, acute or with an acumen to 2.5 cm. long, base narrowly to broadly rounded or shallowly cordate, margin entire; main veins prominent beneath, reticulum not at all to markedly prominent; glabrous above except for the usually pubescent main veins, venation beneath moderately to sparsely pubescent, varying subglabrous, hairs colourless, weak and undulate or crisped, or some, rarely almost all, stouter and hooked at the tip; lateral veins 8–14 pairs, curved; intercostals parallel, varying reticulate; dark green, drying brown, grey-green or greenish, venation concolorous, varying straw-coloured; petiole 5–18 mm. long.

Inflorescences solitary in leaf-axils or the male heads sometimes borne

on short-shoots on older wood. *At anthesis: male head* (3–)5–15 mm. across, globose to short-obovoid; perianths of 3 or 4 segments, free or fused for half their length, 0.4–0.5 mm. long; stamen 0.75 mm. long, filament tapering above, anther-cells globose, 0.2 mm. long; bracts stoutly stalked, heads peltate, to 0.6 mm. across, these and perianths puberulent; peduncle 2–15 × 1 mm., velutinous, hairs usually crisped, varying subglabrous; *female head* with peltate bracts nearly all shed and styles exerted to 0.4 mm. through perforations in the surface (in var. *papillosus* through papillae). *Syncarp* to 6 cm. across, subglobose, yellow, drying orange to brown or black, the surface smooth, velutinous, often glabrescent, varying subglabrous and then clearly areolate; wall c. 2 mm. thick; proximal region of perianths fused, fruiting perianths numerous, thin-walled, “seeds” (indurated pericarps) ellipsoid, variously compressed, 11 × 8–10 mm.; core 10–15 mm. across; peduncle 3–35 × 3 mm., velutinous, hairs usually crisped, varying subglabrous.

DISTRIBUTION: in rain forest to 6000 ft.; Philippines (Mindanao), Celebes (Manado) ?, Moluccas, New Guinea, Bismarck Archipelago, Japen, Salawati, Aru Islands, Louisiade Archipelago, Solomon Islands.

This widely distributed species exhibits a range of variation in the type and abundance of the indumentum, the length of the peduncles, the shape of the leaves and the prominence of their venation which is greater than in any other member of subgenus *Pseudojaca*. Four variants can be distinguished, each with a consistent geographical distribution, and, although three of these are based primarily on vegetative characters, it seems desirable to describe them all at the varietal level, and so to bring some order into the rather chaotic variation presented by this species at first sight.

The most widely distributed of the varieties is var. *refractus*, which extends from Mindanao through New Guinea to the Louisiade Archipelago, and has fairly broad, obovate-oblong (varying to elliptic) leaves with moderately prominent venation and a variable indumentum, a relatively large male head (5–15 mm. across), and variable peduncles (3–15 mm. in the male inflorescence and (?2–)15–30 mm. in the syncarp). Specimens from a limited area in the mountains of eastern New Guinea, which have rather small, narrow leaves with a more strongly developed reticulum, are assigned here, but are discussed further under the variety. In the Solomon Islands, var. *papillosus* is distinguished primarily by the papillate surface of the female head at anthesis, but also by the often ovate-elliptic leaves. The indumentum is variable, as is the length of the peduncles (3–5 mm. in the male inflorescence and 5–35 mm. in the syncarp), and the male head is rather smaller than in var. *refractus* (3–8 mm. across).

The two other varieties recognized in *Artocarpus vrieseanus* have ranges overlapping that of var. *refractus* in New Guinea, but are distinguished by the thinly pubescent to subglabrous leaves, which are often rather thinly coriaceous and narrow in outline, and by the small male heads (4–7 mm. across). The type variety extends from northeastern New Guinea west-

ward to the Moluccas and perhaps Celebes (with one doubtfully identified collection from Bougainville). The leaves have a slender, slightly prominent reticulum, and these and the twigs are thinly pubescent or subglabrous; except in a few almost entirely glabrous specimens some of the hairs are consistently hooked at the tip (such hairs being found otherwise only in a few collections of var. *refractus*). The peduncles are rather long, measuring (4-)6-17 mm. in the male inflorescence and 15-35(-65) mm. in the syncarp. Finally, var. *subsessilis*, which is found in New Guinea, the Bismarck Archipelago and Bougainville, has glabrous leaves lacking a prominent reticulum. Only the young twigs are puberulent, with straight or crisped, but not hooked, hairs, and the inflorescences have short peduncles (2-3 mm. long in the male inflorescence and 3-7(-13) mm. in the syncarp).

The biological significance of these varieties, apart from var. *papillosus* which has presumably arisen through geographical isolation, is not clear. The three others appear to be genuinely distinct, and not merely adult or sapling forms. Whereas var. *refractus* occurs widely in New Guinea, var. *vrieseanus* and var. *subsessilis* have not yet been recorded from the southern regions, and these entities may be separated in northern New Guinea by slightly different ecological requirements, although no evidence in support of this can be gained from field notes.

The species that appears to be most closely related to *Artocarpus vrieseanus* is *A. xanthocarpus*, from the northern and central Philippine Islands, and the characters distinguishing the latter are discussed below, under that species. Some of the varieties of *A. vrieseanus* may, however, bear a strong superficial resemblance to two apparently less closely allied species, *A. dadah* and *A. fretessii*, and the variability of *A. vrieseanus* is such that only the complete fusion of the perianths in the syncarp provides an entirely satisfactory taxonomic distinction. The west Malaysian *A. dadah*, in addition to having the proximal region of the perianths free, differs in the colour of the syncarp, which is green with deep pink flesh (instead of yellow), in the straight hairs on the twigs (sometimes hooked at the tip), and in the more numerous lateral veins on the larger leaves (to 20 instead of 13(-14) pairs).

The range of *Artocarpus fretessii*, which extends from Borneo and the Philippines to the Vogelkop of New Guinea, overlaps that of *A. vrieseanus* to a considerable extent, but the syncarps of these two species, also, can usually be distinguished externally. In *A. vrieseanus* the syncarp is subglobose, with numerous seeds, but in *A. fretessii* it is distinctly lobed, each lobe usually containing one of the relatively few (up to 12) seeds. There is a further difference between the species in the interfloral bracts of the male heads: in the former rather few of these have well-developed, peltate heads, with stout stalks expanding gradually into the head, and there are numerous intermediates to the perianth segments, whereas in the latter there are many peltate bracts with slender stalks and well-defined heads, and few intermediates. These distinctions, and also the complete fusion of the perianths in the syncarp, have been confirmed for all the varieties

recognized in *A. vrieseanus*. No satisfactory vegetative characters can be found serving to distinguish this species and *A. fretessii* over the whole of their ranges, but notes are given below, under the three varieties with a range overlapping that of *A. fretessii*, that will, it is hoped, aid in the identification of sterile material.

KEY TO THE VARIETIES OF *ARTOCARPUS VRIESEANUS*

1. Leaves without a prominent reticulum, glabrous; young twigs puberulent, the hairs straight or crisped; male peduncle to 3 mm., syncarp peduncle to 7(-13) mm. long. var. *subsessilis*.
1. Leaves with the reticulum slightly to markedly prominent beneath; reticulum and twigs usually pubescent, or if subglabrous, some of the hairs hooked at the tip.
 2. Leaves rather thinly coriaceous, often narrow, the reticulum slightly prominent beneath; reticulum and twigs subglabrous to thinly pubescent, except when nearly glabrous some of the hairs hooked at the tip; male peduncle (4-)6-17 mm., syncarp peduncle 15-35(-65) mm. long. var. *vrieseanus*.
 2. Leaves moderately to thickly coriaceous, the reticulum distinctly prominent beneath; reticulum and twigs pubescent, rarely subglabrous, the hairs undulate or crisped, rarely a few hooked at the tip.
 3. Female head papillate at anthesis (Solomon Islands). var. *papillosus*.
 3. Female head smooth at anthesis. var. *refractus*.

var. *refractus* (Becc.) Jarrett, stat. nov.

Artocarpus refracta Becc. For. Borneo, 630. 1902. Holotype, Aru Islands, *Beccari s.n.* (FI); isotypes (FI).

Twigs pubescent or rarely subglabrous, the hairs appressed and crisped, varying patent and straight or undulate, rarely a few stouter and hooked at the tip. *Leaves* obovate-oblong, varying obovate-elliptic, elliptic or oblong, sometimes narrow; main veins prominent beneath, the reticulum moderately, sometimes markedly, prominent, pubescent or rarely subglabrous, the hairs undulate or crisped, rarely a few stouter and hooked at the tip. *In-florescences at anthesis: male head* 5-15 mm. across, peduncle 3-15 mm. long; *female head* with the surface smooth. *Syncarp*, peduncle (?2-)15-30 mm. long.

DISTRIBUTION: in primary and secondary forest from sea level to 6000 ft.; Mindanao, Moluccas, New Guinea, Salawati, Aru Islands, Louisiade Archipelago.

Philippines. MINDANAO. *Ahern* 676 (BO, ♀). Bukidnon: Mt. Katanglad, *Sulit PNH* 9951 (A, L, ♂). Davao: *De Mesa FB* 27486 (K, ♀); Todaya, *Copeland* 1244 (P, ♂); Todaya, Mt. Apo, *Elmer* 10932 (A, BM, BO, K, L, ♀). Zamboanga: San Ramon, *Hallier* 4671a (L). **Moluccas.** OBI. *Atasrip* 45 (L).

New Guinea. VOGELKOP. Manokwari: Bostuin Tafelberg, *Versteegh BW* 3830 (L, ♀). Sorong: Sausapor, *Versteegh BW* 4619 (L, ♂). **DUTCH NORTH NEW GUINEA.** Idenburg River, Bernhard Camp, *Brass & Versteegh* 14004 (A),

14021 (A, ♀); Mamberamogebiet, Pionier Bivac, *Lam* 730 (BO, K, L, U, ♂, ♀). DUTCH SOUTH NEW GUINEA. Bian River, *Branderhorst* 275 (BO, K, ♀); Sungei Aëndua, Mimika, *bb* 32900 (K, L). PAPUA. Central Division: Iawarere, *Brass* 674 (A, K, ♂); Mafulu, *Brass* 5184 (A, BO, US, ♀), 5394 (A, BO, K, US, ♀); Sogeri, *Forbes* 86 (BM, L, ♂). Northern Division: Isuarava, *Carr* 15351 (A, BM, K, L, SING, ♂), 15552 (BM, K, L, SING, ♂), 15762 (BM, K, L, SING); c. 8 km. n. of Saiho along road to Divinikoari, *Hoogland & Macdonald* 3492 (A, K, L, ♀); Tufi Subdistrict, halfway between Wanigela and Itoto, *Hoogland* 4822 (A, BM, K, L, ♂, ♀). Western Division: lower Fly River, e. bank, opposite Sturt Island, *Brass* 8117 (A, L, ♂, ♀). MANDATED TERRITORY OF NEW GUINEA. Madang District: Kani-gebirge, *Schlechter* 17065 (A, K, L, ♂, ♀). Morobe District: Matap, *Clemens* 11174 (A, ♀); Ogeramnang, *Clemens* 4550, 5138 (A, ♂, ♀); Quembung mission trail to Sattelberg, *Clemens* 1244 (A, ♀); Sattelberg, *Clemens* 7584 (A). SALAWATI. Kaloal, *Koster BW* 4253 (L). ARU ISLANDS. Giabulengan, *Beccari*, May 1873 (FI, ♂, ♀). LOUISIADE ARCHIP. Rossel Island, Jinju, *Brass* 28569 (A, L, ♂).

With the type of *Artocarpus refractus*, which came from the Aru Islands, Beccari cited an additional specimen, *PB* 74, from Kapaor, Papua Onin, but this is apparently not in the Herbarium Universitatis Florentinae and has not been found elsewhere.

Quite a wide range of variation is found within this variety, particularly, as noted above, in some collections from the mountains of eastern New Guinea. Elsewhere in New Guinea, var. *refractus* has not been seen from above 3000 feet (although one of the collections from Mindanao was made at 5500 feet), but from the Central and Northern Divisions of Papua, and the Madang and Morobe Districts of northeast New Guinea several collections from an altitude of 3000 to 6000 feet have been seen. Some of these (*Brass* 5184, 5394, *Forbes* 86, *Carr* 15351, 15552, 15762 and *Clemens* 11174) have rather small, narrow leaves characterized by a very strongly developed, netted reticulum and could, perhaps, be regarded as representing a distinct entity. However, the remaining four (*Schlechter* 17065 and *Clemens* 4550, 5138 and 7584) are intermediate to the typical form, having rather broadly elliptic leaves with a netted, but less prominent, reticulum.

It is not possible to give satisfactory characters for distinguishing male or sterile collections of *Artocarpus vrieseanus* var. *refractus* from *A. fretessii*, apart from the difference in the bracts mentioned above. However, in the former the male heads are usually somewhat larger, with shorter peduncles relative to the size of the head; they are also only rarely borne on short-shoots, whereas this is very common in the latter. On the whole, *A. fretessii* tends to have a smaller leaf, with a more distinct, often straw-coloured reticulum, and somewhat more ascending lateral veins, but rather similar leaves are found in the mountain form of var. *refractus*. In the eastern Moluccas and New Guinea, *A. fretessii* is also distinguished by the rather markedly cordate base of the leaf.

var. *papillosus* Jarrett, var. nov.

Ramuli juniores pubescentes, pilis appressis crispatisque, vel patentibus et rectis undulatisve. *Folia* ovati-elliptica, elliptica vel obovati-elliptica;

costa nervi lateralesque subtus prominentes, venulae prominulae, pubescentes, pilis plus minusve undulatis, ad subglabri. *Inflorescentiae ad anthesin: capitula mascula* 3–8 mm. diametro, pedunculis 3–5 mm. longis; *capitula feminea* superficie plana. *Syncarpia* pedunculis 5–35 mm. longis.

HOLOTYPE: Solomon Islands, *Kajewski* 2360 (A); isotypes (BM, K, L, P).

DISTRIBUTION: in rain forest from sea level to 4000 ft.; Solomon Islands.

Solomon Islands. BOUGAINVILLE. Kugumaru, Buin, *Kajewski* 1920 (A, K, ♂). GUADALCANAL. Berande, *Kajewski* 2436 (A, BM, K, P, ♀); Vulolo, Tutuve Mt., *Kajewski* 2501 (A, BM, P, ♀). MALAITA. Quoimonapu, *Kajewski* 2360, Dec. 1930 (A, BM, K, L, P, ♂, ♀). SAN CRISTOBAL. Balego-nagonago, *Brass* 2826 (A, K, L, ♂, ♀).

Seed formation in this variety is often somewhat irregular, so that the syncarp is slightly lobed, while the surface between the lobes remains papillate as in *A. fretessii*; the lobes, however, differ from those found in the latter species in being shallow and ill defined.

var. *vrieseanus*

Artocarpus vrieseana Miq. Ann. Mus. Lugd.-Bat. 3: 212. 1867; Renner, Bot. Jahrb. 39: 369. 1907. Syntypes, Batjan, *De Vriese s.n.*, Celebes, Manado, *De Vriese s.n.* (L); lectotype, Batjan, *De Vriese s.n.* (L).

Artocarpus antiarifolia Becc. For. Borneo, 630. 1902. Holotype, Jobi [Japen], *Beccari s.n.* (FI); isotype (FI).

Artocarpus cumingiana Tréc. var. *stenophylla* Diels, Bot. Jahrb. 67: 177. 1935. Holotype, northeast New Guinea, *Ledermann* 12863 (B); isotype (K).

Twigs thinly pubescent to subglabrous, except when nearly glabrous some hairs patent or recurved and hooked at tip, the rest patent to crisped. Leaves oblong-elliptic to elliptic or obovate-elliptic, often narrowly so; main veins prominent beneath, reticulum slightly so, indumentum as on twigs. *Inflorescences at anthesis: male head* 4–7 mm. across, peduncle (4–)6–17 mm. long; *female head* with the surface smooth. *Syncarp*, peduncle 15–35(–65) mm. long.

DISTRIBUTION: in primary and secondary forest from sea level to 3000 ft.; Celebes (Manado) ?, Moluccas (Batjan), New Guinea.

Celebes. (?) NORTH PENINSULA. Manado, *De Vriese* (L, ♀). Moluccas. BATJAN. *De Vriese* (L, ♂, ♀).

New Guinea. DUTCH NORTH NEW GUINEA. Geelvink Bay, Nabire, *Kanehira & Hatusima* 11538 (A, BO, ♂), 11584 (A, BO, ♀); Sarmi, Tor River, Dirdjan, *Leden BW* 5364 (L, ♂, ♀). MANDATED TERRITORY OF NEW GUINEA. Madang District: near the Gogol River, near Mawan village, *Hoogland* 4928 (A, K, L, ♂, ♀); Kani-gebirge, *Schlechter* 17854 (A, K, L, ♂); Wobbe, *Schlechter* 16439 (A, K, L, ♂). Sepik District: Kaiserin Augusta [Sepik] River, Felsspitze, *Ledermann* 12863, Aug. 1913 (BM, K, ♂). JAPEN. Ansum, *Beccari s.n.*, Apr. 1875 (FI, ♂); near Serui, Kaunda, *Aet & Idjan* 568 (L, ♂); Serui, Watibu, *bb* 30249 (BO, L, SING, ♀).

The type material of *Artocarpus vrieseanus* in the Rijksherbarium,

Leiden, consists of six sheets purporting to come from both Celebes and Batjan, but comparison of these indicates that only three gatherings are involved and that there has been some confusion in the labelling. The two sheets labelled as coming from Celebes, one of which has an attached submature syncarp (peduncle 55 mm.), match exactly the leaves and detached syncarp (peduncle also 55 mm.) of one of the sheets stated to be from Batjan. Since the other two gatherings are both labelled as from Batjan the record from Celebes appears somewhat doubtful at present. The second gathering consists of two sheets with immature male inflorescences attached and in an envelope (the head to 7 mm. across and the peduncle to 17 mm. long). A twig on one of these sheets, which bears a leaf and a syncarp comparing closely with the first gathering, was probably mounted here by mistake, and the other sheet is therefore chosen as the lectotype. The third gathering, which is very similar to the first, is represented by a sterile sheet from Batjan (matched by another sheet from Hasskarl's herbarium not annotated by Miquel). All the material is undoubtedly referable to the entity under consideration, since the perianths in the syncarp are completely fused, the bracts in the male head are stoutly stalked, and the leaves are thinly coriaceous with a slightly prominent reticulum. No hooked hairs were found on the leaves or twigs, but this is true of a few other almost completely glabrous collections of var. *vrieseanus*, such as *Kanehira & Hatusima 11584*, which is a good match for the first gathering mentioned above.

A collection from Kugumaru, Buin, Bougainville, *Kajewski 1940* (A, BM, K, L, P, SING, ♂, ♀), may be referable to this variety; the leaves are rather broadly elliptic, and these and the twigs are definitely pubescent, but many of the hairs are hooked at the tip and the young syncarps are smooth, not papillate as in var. *papillosus*. A sterile collection from Ambon, *De Fretes s.n.* (CAL, GH, L, U), which likewise has pubescent leaves but abundant hooked hairs, may also be referable here since the leaves are, in addition, scarcely cordate (see below); it is, however, discussed further under *A. fretessii*. The latter may be distinguished vegetatively by the definitely pubescent leaves with a more prominent reticulum, the absence of hooked hairs (occasionally a few present in specimens from the Vogelkop), and, in the eastern Moluccas and New Guinea, by the rather markedly cordate leaf base.

var. *subsessilis* Jarrett, var. nov.

Ramuli juniores, puberulentes, pilis appressis et rectis crispatisve, mox glabrescentes. *Folia* elliptica vel obovati-elliptica, saepe angusta; costa nervi lateralesque tantum subtus prominentes et puberulentes vel glabri. *Inflorescentiae ad anthesin: capitula mascula* 5–7 mm. diametro, pedunculis 2–3 mm. longis; *capitula feminea* superficie plana. *Syncarpia* pedunculis 3–7 mm. (*Floyd 3453* ad 13 mm.) longis.

HOLOTYPE: northeast New Guinea, *Hoogland 4999* (A); isotypes (K, L).

DISTRIBUTION: in primary and secondary forest from sea level to 5500 ft.; New Guinea, Bismarck Archipelago, Solomon Islands (Bougainville).

New Guinea. VOGELKOP. Steenkool, road to Tembuni, *van Royen* 3591 (L). **DUTCH NORTH NEW GUINEA.** Hollandia, Holtekang, *Brouwer BW* 1539 (L, ♀); Wissel Lake region, Lake Tigi, *Eyma* 4883 (L, ♀); Wissel Lake region, foot of Mt. Bubi-ro and Enarotali, *Eyma* 5124 (L, ♀). **PAPUA.** Milne Bay District: Cape Vogel Peninsula, Menapi, *Brass* 21660 (A, ♀). Northern Division: Kokoda, *Carr* 16420 (L); Tufi Subdistrict, near Koreaf village, *Hoogland* 4813 (A, BM, K, L, ♀). **MANDATED TERRITORY OF NEW GUINEA.** Madang District: Gogol River valley, near Jal village, *Hoogland* 4999, July 1955 (A, K, L, ♂, ♀). Morobe District: Lae, Botanic Gardens ("indigenous"), *Womersley NGF* 9079 (A, L, ♀). **NEW BRITAIN.** Keravat, *Floyd* 3453 (A, BM, K, L, ♀). **Solomon Islands.** BOUGAINVILLE. Teop Island *Waterhouse* 46 (K, ♂).

This variety can readily be distinguished from *Artocarpus fretessii* by the almost entirely glabrous leaves lacking a prominent reticulum.

34. **Artocarpus xanthocarpus** Merr. Publ. Gov. Lab. Manila 17: 10. 1904, "*xanthocarpa*," Philip. Jour. Sci. 1, Suppl. 43. 1906; Elmer, Leaf. Philip. Bot. 2: 626. 1909. Holotype, Luzon, *Whitford* 367 (PNH, destroyed); isotypes (K, P, US); lectotype (P).

Artocarpus lamellosa Blanco, nomen dubium, Elm. Leaf. Philip. Bot. 2: 625. 1909.

Artocarpus lanceolata auct. non Tréc., Merr. Enum. Philip. Pl. 2: 42. 1923.

Artocarpus rubrovenius auct. non Warb., Merr. Philip. Jour. Sci. Bot. 3: 401. 1908.

Small trees, height to 8 m. *Twigs* 1.5–3 mm. thick, smooth or finely rugose, appressed-puberulent, soon glabrescent. *Leaves* 5.5–20 × 2.5–9 cm., obovate-elliptic, varying obovate- or elliptic-oblong, with an acumen to 3 cm. long, base cuneate, varying narrowly rounded, glabrous, margin entire; main veins prominent beneath, intercostals slightly so; lateral veins 6–11 pairs, curved; intercostals few, not parallel; green, drying brownish or greenish, venation straw-coloured, reddish or nigrescent in young leaves; petiole 5–23 mm. long.

Inflorescences solitary or paired in leaf-axils. *At anthesis: male head* 3–6 × 3–4 mm., globose to obovoid; perianths tubular, bilobed above, 0.5 mm. long; stamen 1 mm. long, filament cylindrical, tapering above, anther-cells ellipsoid, 0.2 mm. long; bracts slenderly stalked, heads peltate, to 0.3 mm. across, these and perianths ciliate; peduncle 2–3 × 0.5 mm., velutinous; *female head* with peltate bracts mostly shed and styles exerted to 0.8–1 mm. through low papillae. *Syncarp* to 5 cm. across, subglobose, shallowly lobed, yellow, drying pale or reddish brown, the surface smooth or nearly so, velutinous, with a few persistent bracts; wall c. 3 mm. thick; proximal region of perianths fused, fruiting perianths several, thin-walled, "seeds" (pericarps with an indurated endocarp) ellipsoid, 8 × 6 mm.; core c. 4 mm. across; peduncle 6–11 × 3 mm., velutinous.

DISTRIBUTION: in forest to 1300 ft.; Mangsi Islands, northern and central Philippine Islands.

Borneo. MANGSI ISLANDS. *Wilkes* (GH, ♂, ♀). **Philippine Islands.** MINDORO.

Merritt FB 9894 (BO, US, ♂); Mansalay, Mt. Yagaw, *Conklin* PNH 17465 (A, L, PNH, ♂). BATANES ISLANDS. *Fenix* BS 3581 (BO, ♂), 3814 (NY, US, ♀); Mt. Iraya, *Ramos* BS 80012 (K, NY, ♂, ♀), 80305 (K, NY, ♀). LUZON. Benguet: *Leano* FB 24715 (NY, US, ♀). Cagayan: *Klemme* FB 6670 (K, NY, US, ♂). Bataan: Lamao River, *Borden* 183 (A, NY, ♂); Lamao River, Mt. Mariveles, *Whitford* 367, June 1904 (K, P, US, ♀). Laguna: Majayjay, *Curran & Merritt* FB 8055 (NY, P, US, ♂). Tayabas: *Labitag* FB 25414 (A, K, P, US, ♂, ♀). Camarines: *Aguilar* FB 14345 (US, ♂); Camarines Sur, Iriga, *Vidal* 1539 (A, K, ♂); Mt. Bagacay, *Ramos & Edano* BS 33925 (SING, ♀). Sorsogon: Irosin, Mt. Bulusan, *Elmer* 16247 (BM, GH, K, L, ♂). BOHOL. *Ramos* 42581 (BM, BO, P, SING, ♀). SIKUIJOR ISLAND. *Piper* 398 (K, P, ♀).

Artocarpus xanthocarpus is, as noted above, apparently most closely allied to *A. vrieseanus*, from which it differs in the longer styles, exerted to c. 1 mm. at anthesis instead of only 0.4 mm., and the slenderly stalked bracts in the male head. Otherwise it is rather similar to *A. vrieseanus* var. *subsessilis*, but it may be distinguished by the base of the leaf, which is usually cuneate and slightly decurrent, instead of rounded or auriculate. The small, entirely glabrous leaves, lacking a prominent reticulum, give *A. xanthocarpus* a strong superficial resemblance to *A. nitidus* ssp. *nitidus*, which also occurs in the Philippines, and distinguishing characters are given below, under the latter entity.

The type material of *A. xanthocarpus* bears mature syncarps only, but styles 1 mm. long have been found persisting on the specimen at the Muséum National d'Histoire Naturelle, Paris. The Wilkes expedition collection from the Mangsi Islands off the northeastern tip of Borneo represents, at present, a rather outlying locality for the species. However, although the specimen is in rather poor condition, it, too, has the long styles on the syncarp and the characteristic, very small male inflorescences. The collections from the Batanes Islands are all distinguished by having a very long, slender acumen to the leaf.

35. *Artocarpus fretessii* Teysm. & Binnend. in Hassk. Abh. Naturf. Ges. Halle 9: 189. 1866, "*Fretissi*"; Merr. Interpr. Rumph. Herb. Amb. 191. 1917.

Metrosideros spuria Rumph. Herb. Amb. 3: 26. t. 13. 1743.

Antiaris fretessii Teysm. & Binnend. Cat. Hort. Bog. 84. 1866, nomen nudum.

Artocarpus dasyphylla Miq. Ann. Mus. Lugd.-Bat. 3: 212. 1867; Renner, Bot. Jahrb. 39: 369. 1907; J. J. Smith, Ic. Bogor. 3: 83. 1907. Syntypes, Celebes, *Riedel* HB 5841, *Teysmann* HB 5787 (U); lectotype, *Teysmann* HB 5787 (U).

Artocarpus erythrocarpa Teysm. ex Miq. Ann. Mus. Lugd.-Bat. 3: 212. 1867, pro. syn.

Prainea rumphiana Becc. For. Borneo, 636. 1902.

Artocarpus dasyphylla Miq. var. *flava* J. J. Smith, Ic. Bogor. 3: 85. t. 234. 1907.

Artocarpus leytenensis Elm. Leaf. Philip. Bot. 1: 279. 1908, 2: 622. 1909; Merr. Enum. Philip. Pl. 2: 42. 1923. Holotype, Leyte, *Elmer* 7243 (PNH, destroyed); isotypes (A, BO, K); lectotype (K).

Artocarpus paloensis Elm. Leaflet. Philip. Bot. 1: 280. 1908, 2: 621. 1909. Holotype, Leyte, *Elmer* 7244 (PNH, destroyed); isotypes (A, BO, K); lectotype (K).

Artocarpus rotundifolia Elm. ex Merr. Enum. Philip. Pl. 2: 42. 1923, pro syn.

Trees, height to 40 m., buttresses small or none, bark pale brown, peeling off in flakes. *Twigs* 1.5–4 mm. thick, pubescent, hairs pale yellow to rufous, usually subappressed and crisped. *Leaves* 6–29 × 3–12 (–32 × 16) cm., obovate-oblong to elliptic, acute, attenuate or acuminate, base broadly cuneate to shallowly cordate (varying to deeply so in the Moluccas and New Guinea), margin entire; juvenile leaves pinnatifid; main veins and reticulum distinctly prominent beneath; glabrous above or nearly so except for the pubescent main veins, venation beneath moderately to sparsely pubescent, hairs colourless, straight or slightly undulate; lateral veins 9–13 pairs, curved, basal 2–4 pairs crowded; intercostals parallel; dark green above, pale green or greyish beneath, usually drying greyish or brownish, paler beneath, venation concolorous, varying straw-coloured; petiole 5–15 mm. long.

Inflorescences solitary or paired in leaf-axils, or more frequently on short-shoots on older wood. *At anthesis: male head* 3–7 mm. across, subglobose or obovoid; perianths of 2 or 3 free segments 0.4–0.5 mm. long; stamen 0.8 mm. long, filament slightly flattened, tapering above, anther-cells subglobose, 0.15 mm. long; bracts slenderly stalked, heads peltate, to 0.3 mm. across, these and perianths sparsely ciliate; peduncle 3–7 mm. long, short-pubescent; *female head* with peltate bracts mostly shed and styles exerted to 0.5 mm. through papillae. *Syncarp* to 4 cm. across, with one to several subglobose lobes, yellow, or dark red to purple, drying olive-brown to rufous, the surface smooth over the lobes, papillate between them, short-pubescent, with a few persistent bracts; wall c. 2 mm. thick over lobes; proximal region of perianths free, fruiting perianths 1–c. 12 (New Guinea, 1 or 2), thin-walled, “seeds” (thin, horny pericarps) subglobose, 8 × 7 mm.; core c. 4 mm. across; peduncle 20–25 (–30) mm., short-pubescent.

VERNACULAR NAMES: *maumbi*, *kelembi*, Celebes; *taewan*, Ambon.

DISTRIBUTION: in forest up to 2000 ft.; eastern Borneo, Philippines, Celebes, Moluccas, New Guinea (Vogelkop).

Borneo. SOUTH AND SOUTHEAST BORNEO. Martapura, Tewingang, *Boschbouwprefstation* 2108 (BO, ♂); Martapura, Twang Bangkal, *bb* 2475 (BO, L, ♀). EAST AND NORTHEAST BORNEO. Loa Haur, w. of Samarinda, *Kostermans* 6902 (L, ♂, ♀). BRITISH NORTH BORNEO. Kamang-sian, *Goklin* 1302 (K, ♂).

Philippine Islands. PALAWAN. Brooks Point, Addison Peak, *Elmer* 12609 (A, BM, K, L, ♂, ♀); Puerto Princesa, Mt. Pulgar, *Elmer* 12944 (A, BM, K, L, ♀). LEYTE. *Franco* FB 26409 (P), *Wenzel* 811 (BM, GH, ♀); Abuyog, Lake Danao, *Krukeberg*, Sept. 1945 (A, ♂); Palo, *Elmer* 7243, Jan. 1906 (A, BO, K, ♀), 7244, Jan. 1906 (A, BO, K, ♂, ♀). BILIRAN. *McGregor* BS 18663 (A, BO, P, SING, ♀). PANAY. Ilo-ilo: Miagao, *Vidal* 3833 (A, K, ♂, ♀). MINDANAO. Surigao: *Ramos & Pascasio* BS 34350 (BM, L, NY, SING, ♀). CAMIGUIN DE MINDANAO. *Ramos* 1196 (BM, P, U, US, ♀).

Celebes. NORTH PENINSULA. Gorontalo: Molinggapoto, *bb* 18022 (A, BO, L). Minahassa: Manado, *Koorders* 19061 (BO, L), *Riedel HB* 5841 (BO, L, U, ♀), 7264 (BO, P), *Teysmann HB* 5723 (BO), 5863 (BO, L, U); Sondaho, *bb* 5573 (BO, L); Tana Wangko, *Teysmann HB* 5787 (BO, U, ♀); Kajuwatu, *Koorders* 19039, 19048, 19055 (BO, L), 19058 (BO, L, ♀), 19431 (BO); Lubu, Amurang, *Koorders* 19052 (BO, L, ♂); Masuka, *Koorders* 19185 (BO, L); Pakuere, *Koorders* 19045 (BO, L); Pinamorangan Mts., *Koorders* 19054 (BO, K, L, ♀); Ratahan, *Koorders* 19043 (BO), 19060 (BO, L, ♀), 19306 (BO); Sembolei, *Koorders* 19062 (BO, ♀); Tondano, *Koorders* 19312 (BO, ♀). CENTRAL CELEBES. Malili, *NIFS Cel./V-216 no.* 226 (BO, L); Malili, Toli Toli, *NIFS Cel./V-216 no.* 109 (BO, ♂); Malili, Usu, *NIFS Cel./III-55 no.* 81 (BO, ♀), *no.* 238 (BO, L, ♂); Palu, Tomado, *bb* 28212 (BO, L); Poso, Tokosondo, *bb* 17977 (A, BO). SOUTHWEST PENINSULA. Baleh-Angien, *Teysmann HB* 12359 (BO, L, ♀), 12481 (BO); Bonthain, Saluang, *NIFS Cel./I-19* (BO, L, ♀); Maleku, *bb* 23909 (BO, L). SOUTHEAST PENINSULA. Kolaka, Parso, *bb* 32510 (A, BO, L, ♀). P. MUNA. Labunti, *bb* 6041 (BO, L, U, ♀).

Moluccas. TALAUD ISLANDS. Karakelang, e. of Beo, *Lam* 2626 (L, ♀). HALMAHEIRA. Djailolo, Tuguir, *bb* 23734 (A, BO, L); Galela, *Beguin* 1867 (BO, L, ♂, ♀); W. Tobelo, *Beguin* 2303 (BO, K, L, SING, ♀). BATJAN. Nanggapil, *sine nom.* IX (BO, ♂). SULA ISLANDS. Mangoli, *bb* 29771 (A, BO, L); Sanana, Kali Waj Gaj, *bb* 28811 (A, BO, L, SING, ♂); Taliabu, n. of Samuja, *bb* 29937 (A, BO, L, SING, ♂). BURU. Wae Ula, *bb* 22801 (BO, ♂).

New Guinea. VOGELKOP. Manokwari: Momi, *bb* 33417 (A, BO, K, L, ♂); Oransbari, *Brouwer BW* 2512, 2576, 2594, *Mangold BW* 2133 (L); Prafi, *Schram* 554 (L); Ransiki, Mioswaas, *Koster BW* 1270 (L); Ransiki, Warsuwi, *Kostermans* 87 (BO, K, L, SING, ♀); Sidai, 65 km. w. of Manokwari, *Koster BW* 4450 (L, ♂); Warnapi, *bb* 33627, 33629 (BO, K, L). Sorong: Warsamson, 25 km. e. of Sorong, *Schram BW* 5904 (L).

Cultivated. MALAYA. Singapore, Hort. Bot., *Cantley* 136 (K, ♂, ♀), *Ridley* 3359 (BM, CAL, K, SING, ♂, ♀). JAVA. Bogor: Hort. Bot., *VII G* 105 (BO, L, ♀), *VIII B* 5 (L, ♂), *Sutrisno* 82 (cult. sub. VII G 105; origin Celebes), Oct. 1957 (L, ♂); Tjiliwung river, *Kostermans*, Aug. 1953 (K, L).

The nomenclatural type of *Artocarpus fretessii* is *Metrosideros spuria* [i] *Taewan mas* of Rumphius, for which Hasskarl provided an identification in 1866 in his key to the "Herbarium Amboinense" with the phrase "*Artocarpus Fretissi* T. & B. Teysm. in litt." The identity of Rumphius' *Taewan mas* with the species under consideration can be established with certainty from the plate (*t.* 13A), which shows the characteristic mature syncarps with rounded lobes and between these the papillate unexpanded surface. The artist has added a "calyx" to one of the fruits, but the likeness is unmistakable and extends to the vegetative characters, while the description is also in agreement. Hasskarl offered no identification for the second plant, *Taewan femina*, treated by Rumphius under *Metrosideros spuria*, but, from the plate (*t.* 13B), it appears to represent the same species at anthesis, when the female heads are globose with the entire surface papillate. In 1754, Linnaeus, in his key to Rumphius (*Herb. Amb.* 11 [resp. O. Stickman]), had incorrectly identified *Metrosideros spuria* as *Ochna jabotapita* L. (see Sprague, *Proc. Linn. Soc.* 165: 151-156. 1955, for a discussion of Linnaeus' later treatment of this species). Merrill, in

his consideration of the "Herbarium Amboinense" (1917), mentioned Teysmann and Binnendijk's name, but was unable to refer Rumphius' plant to any known species of *Artocarpus*. However, on the Bogor sheet of *Beguin 1876*, which was collected in 1921 in Halmaheira, there is a note to the effect that Beguin thought he had found *Metrosideros spuria*.

Artocarpus fretessii antedates by one year and must replace the name *A. dasyphylla* Miq. (1867) under which the species has been known in Indonesia. Teysmann and Binnendijk's epithet was based on the name of De Fretes, a resident of Ambon who presumably sent them the living material that appeared in their catalogue (1866) of the Hortus Bogoriensis under a *nomen nudum*, *Antiaris fretessii*, with the source given as Ambon and the vernacular name as *taewan*. The assumption that this plant was identified with *Taewan mas* and the generic name corrected to *Artocarpus* in Teysmann's communication to Hasskarl is supported by a specimen at Leiden from the Hortus Bogoriensis, collected from a plant numbered *VII G 105*, which is referable to this species and bears the determination "*Artocarpus fretessii*," with another note referring to *Antiaris fretessii* of the catalogue.⁴ (A recent collection from this tree, however, gives the source as Celebes.) There is also in existence a sterile collection by De Fretes from Amboina, *HB 5562*, which bears on the sheet in the herbarium at Utrecht a reference to *Metrosideros spuria*. However, as already noted under *Artocarpus vrieseanus*, the identity of the collection is doubtful and it is perhaps better referred to that species. It was determined only as *Artocarpus* but was cited as *A. lakoocha* by Miquel (Ann. Mus. Lugd.-Bat. 3: 313. 1867) and under *A. lakoocha* var. *malayana* (= *A. dadah*) by King (Ann. Bot. Gard. Calcutta 2: 15. 1889).

Artocarpus fretessii again shows considerable variability in both inflorescences and vegetative characters, particularly in the colour of the syncarp. Red or purple fruits are reported from Celebes and the Sula Islands, while yellow ones are recorded from Borneo, Celebes and the Moluccas. Although it would seem, from the frequent absence of syncarps from collections for which their colour is reported, that the yellow male inflorescences may be mistaken for them in the field, the variation is undoubtedly genuine. *Artocarpus dasyphylla* was described by Miquel as having red fruits, and J. J. Smith (1907) described the yellow-fruited form as var. *flava* from a plant of unknown provenance in the Hortus Bogoriensis. There appears to be no other difference correlated with that of the fruit colour, nor is there any geographical separation of the two forms. If the two were to be maintained as distinct, a new name would be required for the red form, since in Rumphius' description the fruit was stated to be yellow. There does not, however, seem to be any real justification for erecting a new variety for such a colour variant.

Variation in leaf shape, on the other hand, shows a definite pattern of distribution in which the leaf tends to become markedly cordate (and often

⁴ It seems best to take *fretessii* as the form in which Teysmann and Binnendijk intended to Latinize the name and to treat the spelling found in Hasskarl as an orthographic error.

somewhat elongate) in the Moluccas and New Guinea, and this is accompanied by a reduction in the number of lobes on the syncarp (each of which usually contains a single seed).

The distinctions between *Artocarpus fretessii* and *A. vrieseanus* are discussed fully above, under the latter species. In the Philippines *A. fretessii* overlaps the ranges of two further species with pubescent leaves. The first of these, *A. ovatus*, may be distinguished by the relatively longer and narrower leaves with more numerous lateral veins (11–20 *vs.* 9–13 pairs), and by the patent hairs on the twigs. The second, *A. subrotundifolius*, may be differentiated from all these species by the broad leaves with long petioles (25–35 mm. *vs.* 5–18 mm.).

36. **Artocarpus reticulatus** Miq. Ann. Mus. Lugd.-Bat. 3: 213. 1867, "*reticulata*," non Heyne ex Wallich, 1831 (nomen nudum), nec Hunter ex Ridley, 1909; Renner, Bot. Jahrb. 39: 369. 1907; Koord. Suppl. Fl. N. O. Celebes 2: t. 3, 3: 1. 1922. Syntypes, Celebes, *Teysmann HB 5272* (U), Ternate, *De Vriese & Teysmann s.n.* (L); lectotype, *Teysmann HB 5272* (U).

Trees, height to 30 m., with small buttresses, bark rough, grey. *Twigs* 3–6 mm. thick, rugose, puberulent with hooked hairs, or glabrous. *Leaves* 15–35 × 8–16 cm., oblong-elliptic, acute or acuminate, base rounded or broadly cuneate, margin entire; main veins and reticulum prominent beneath, the reticulum rather acutely so; glabrous, or the main veins above and the venation beneath scabrid-puberulent, the hairs hooked at the tip; lateral veins 12–15 pairs, curved, basal pairs slightly crowded; intercostals parallel; green, paler beneath, drying brown to yellow-green, usually paler beneath, venation concolorous; petiole 13–25 mm. long.

Inflorescences solitary or paired in leaf-axils. *At anthesis: male head* (immature) c. 15 mm. across, obovoid; perianths of 3 or 4 free segments 0.2 mm. long; stamen . . . ; bracts slenderly stalked, heads peltate, to 0.3 mm. across, short-ciliate; peduncle 13 × 1 mm., short-pubescent; *female head* with peltate bracts mostly shed and styles exerted to 1.5 mm. through prominent papillae. *Syncarp* to 6 cm. across, subglobose or lobed, orange, drying brown, the surface verrucose throughout from conical papillae, or becoming nearly smooth over the lobes, pubescent, with scattered persistent bracts; wall c. 5 mm. thick over lobes; proximal region of perianths free, fruiting perianths several, somewhat fleshy, "seeds" (indurated endocarps) ellipsoid, 12 × 8 mm.; core c. 15 mm. across; peduncle 25–45 × 4 mm., velutinous.

VERNACULAR NAMES: *maumbi*, *maumbi sela*, Celebes.

DISTRIBUTION: in forest to 2000 ft.; Celebes, Moluccas (Ternate).

Celebes. NORTH PENINSULA. Minahassa: Karoa, near Papo, *Koorders 19051* (BO, L, ♂); Lolombulan, near Pakuere, *Koorders 19049* (BO, L); Amurang, *sine nom. et num.* (BO, ♀); Amurang, Lobah Kolai, *bb 17125* (A, BO); Lemo, *bb 7536* (BO); Ratahan, *Koorders 19053* (BO, L), *Teysmann HB 5272* (BO, CAL, L,

U, ♀); Pingsan, near Kajuwatu, *Koorders 19046, 19047* (BO, L). CENTRAL CELEBES. Malili, Kawata, *NIFS Cel./V-88* (BO, K, L, ♂, ♀). P. MUNA. Lamiko, *bb 21754* (A, BO, L, ♀). **Moluccas.** TERNATE. *De Vriese & Teysmann* (L).

The inflorescence characters of *Artocarpus reticulatus* are intermediate between those of *A. fretessii* and *A. subrotundifolius*, but provide clear distinctions from each of these species. The syncarp is usually strongly lobed as in *A. fretessii*, but the surface is more prominently papillate, and the styles are long-exserted as in *A. subrotundifolius* (to 1.5 mm. instead of to 0.5 mm.), though fewer seeds are formed than in the latter species. The male inflorescence, although it has been seen only when immature, apparently lies between the two other species in both the size of the head and the length of the peduncle. Vegetatively, *A. reticulatus* may be distinguished from *A. fretessii* by the glabrous or nearly glabrous leaves and twigs, and by the rather acutely prominent reticulum. From *A. vrieseanus* var. *vrieseanus* it is less readily distinguished, but the leaves are usually larger with more numerous, parallel intercostals, and a longer petiole (13–25 vs. 5–15 mm.).

37. ***Artocarpus subrotundifolius*** Elmer, *Leafl. Philip. Bot.* 1: 281. 1908, "*subrotundifolia*," 2: 619. 1909; Merr. *Enum. Philip. Pl.* 2: 43. 1923. Holotype, Leyte, *Elmer 7265* (PNH, destroyed); isotypes (A, BO, K); lectotype (K).

Artocarpus nitidus auct. non Tréc., Ahern, *Timber Tree Sp. Philip.* 35. 1901, tabula sola.

Trees, height to 25 m. *Twigs* 4–6 mm. thick, smooth or rugose, red-brown to fulvous pubescent, hairs straight or undulate, subappressed or patent, slowly glabrescent. *Leaves* 18–36 × 11–22 cm., broadly elliptic to obovate-oblong, short-acuminate, base cordate, varying broadly rounded and slightly oblique, margin entire; main veins and reticulum prominent beneath; glabrous or nearly so above except for the pubescent main veins, venation beneath pubescent, hairs colourless, straight, or some on the main veins stout and hooked at the tip, old leaves glabrescent, slightly scabrid; lateral veins 10–14 pairs, basal 2–3 pairs crowded; intercostals parallel; bright green above, duller beneath, drying red-brown to blue-grey above, paler beneath, venation usually concolorous; petiole (15–)25–35(–65) mm. long.

Inflorescences solitary or paired in leaf-axils. *At anthesis: male head* (20–)25–50 × 20–35 mm., obovoid, ellipsoid or subglobose; perianths of 3 or 4 free segments 0.6 mm. long; stamen 1 mm. long, filament tapering slightly above, anther-cells subglobose, 0.2 mm. long; bracts rather slenderly stalked, heads peltate, to 0.5 mm. across, these and perianths ciliate; peduncle (7–)15–22 × 3 mm., indumentum as twigs; *female head* with peltate bracts mostly shed and styles exserted to 1–2.5 mm. through conical papillae. *Syncarp* to c. 6 cm. across, globose, shallowly lobed, drying brown, the surface papillate or becoming nearly smooth, pubescent, with scattered persistent bracts; wall c. 2 mm. thick; proximal region of peri-

anths free, fruiting perianths numerous, thin-walled, "seeds" (indurated endocarps) subglobose, 14 mm. across; core c. 30 mm. across; peduncle 40(?)–75 × 5–7 mm., indumentum as twigs.

DISTRIBUTION: in forest to 1000 ft.; Philippine Islands.

Philippine Islands. LUZON. Zambales: Mt. Pinatubo, *Fox PNH 4677* (A, ♀). Camarines: *Alvarez FB 21235* (K, US, ♀). Sorsogon: *Curran FB 10541* (BO, K), *10542* (NY, US, ♀), *Vidal 3838* (K, ♀); Irosin, Mt. Bulusan, *Elmer 16990* (A, BM, K, L, ♂, ♀). SAMAR. *Lasquety FB 27032* (BO), *Ramos 1604* (BM, BO, GH, L, P, SING, ♂), *Phasis 25774* (P, ♀). LEYTE. *Rosenbluth FB 12789* (K, NY, US, ♂, ♀), *Wenzel 860* (BM, GH, ♂, ♀), *1576* (A, BM, GH, ♂); near Gacao, *Glassman 794* (A, ♂, ♀); Palo, *Elmer 7265*, Jan. 1906 (A, BO, K, ♂). MINDANAO. Surigao: *Wenzel 3297* (A, BO, GH, K, ♂), *Ramos & Pascasio BS 34757* (NY, ♂).

The maximum size attained by the male inflorescence in this species is considerably larger than in any other species of subgenus *Pseudojaca*, but the dimensions of both the head and the peduncle are rather variable. However, the characteristic, broad, long-petiolate leaves enable male and sterile collections to be assigned to this species with certainty. The well-exserted styles at anthesis and the large syncarps, usually with long peduncles (but measuring only 7 mm. at anthesis in *Glassman 794*, cf. the male inflorescence), are equally distinctive. Older leaves and twigs are often almost completely glabrescent, and, since growth usually occurs in flushes, there may be a considerable difference in appearance between young and old shoots.

[*To be concluded*]